TECHNOLOGY PROTECTION AND LICENSING PERFORMANCE OF HIGHER EDUCATION INSTITUTIONS (HEIs) IN THE PHILIPPINES

A Dissertation

Presented to

The Faculty of the College of Graduate Studies

Samar State University

Catbalogan City, Samar

In Partial Fulfillment

of the Requirements for the Degree

Doctor in Philosophy

Major in Technology Management

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March 2017

APPROVAL SHEET

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ACKNOWLEDGMENT

Inspiration and motivation have always played a key role in the success of any venture.

First of all, I would like to thank our Almighty God for good health and wellbeing that were necessary to complete this humble work and has guided me to work on the right path of life. Without his grace this work could not become a reality. Next to him is my son, Vin Michelle, who will always be my inspiration and constant source of joy and love. To my parents, Msgt. Vivencio C. Lucaban and Mrs. Ligaya B. Lucaban whom I am greatly indebted for the gift of life; To my sisters, Liberty L. Solamin, Venice B. Lucaban and Venus B. Lucaban for their unconditional love; To my aunt Mrs. Florencia L. Lagria for her invaluable assistance and support;

I am grateful to Dr. Marilyn D. Cardoso, University President, who served as my inspiration and who demonstrated that truly excellence is never an accident, it is always the result of high intention, sincere effort and intelligent execution;

I would like to thank my adviser, Dr. Felisa E. Gomba, Vice President for Academic Affairs, who has the attitude and the substance of a genius, for her guidance, support and invaluable comments for the completion and success of this study;

I am indebted to Dr. Ronald L. Orale, Vice President for Research and Extension for sharing his expertise and his precious time to improve this work.

The staff of the Planning, Research and Extension Services and Academic Affairs, Dr. Marlyn Lanzarrote, Ms. Jocelyn Macapañas, Mr. Harold Pedraza, Mr. Zaldy Jabiñar, Ms. Rubi Parrocho, Ms. Rowena Belida, Engr. Vincent Montaño, and Dr. Redentor Palencia who put their faith in me and whose gift of friendship is beyond compare;

To my Pastor, Rev. Samuel Nacionales and brethren in Christ for their guidance and for showing confidence in my work;

I am highly indebted to the members of the panel of examiners, Dr. Victoria M. Tafalla, Dr. Simon P. Babalcon Jr., Dr. Eusebio T. Pacolor, Dr. Bienvinido T. Balanlay of University of the Eastern Philippines and Dr. Marilyn D. Cardoso for their expertise and immense knowledge to review and improve this work during the oral defense;

I am truly thankful to the Intellectual Property Office of the Philippines (IPOPHL) and my ITSO family for fostering innovation and creativity within me and for letting me discover the world of IP;

My sense of gratitude to one and all who, directly or indirectly, have lent their helping hand in this venture, who have pushed me farther than I thought I could go, for the inspiration and wisdom in my quest to excellence.

Vivian L. Moya

DEDICATION

To Vin Michelle,

the love of my life,

my source of joy.

ABSTRACT

This study was conducted to determine the scope, impact and performance of technology protection originating from Higher Education Institutions (HEIs) in the Philippines. The research design used in the conduct of the study was descriptive-correlational research. Descriptive research is most effectively applied to studies aimed at gathering additional information, learning more about an area of interest or becoming familiar with a topic. As to the profile of HEIs in terms of accrediting agencies, all public or 38 percent of the total HEI respondents had the Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACUP). For private institutions, the Philippine Association of Colleges and Universities Commission on Accreditation (PACU-COA) top the accrediting agency with 17 percent of the total HEI respondents followed by the Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU) at 16 percent. All 351 higher education institutions in the Philippines vary in terms of number of full time faculty, academic programs offered, teaching loads of faculty, status of accreditation, accrediting agencies, R&D Budget, IP Budget and Policies. Hence, each higher education institution had their own distinctive nature and characteristics. There is a need to develop a technology protection and licensing plan for both public and private Higher Education Institutions (HEIs) in the Philippines that will serve as a guide to improve their performance in innovation and commercialization.

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THE PROBLEM AND ITS SETTING

Introduction

In the recent years, universities and higher education institutions (HEIs) have undergone profound changes. The paradigm of universities has shifted from the traditional aspects of teaching and learning towards building communities, economies and patterns of leadership. Education, either basic or higher, plays a key role in development of human capital that subsequently brings about the establishment of sound economies and harmonious communities (Malik, 2014). Universities are now seen as crucial national assets in addressing many policy priorities, and as: sources of new knowledge and innovative thinking; providers of skilled personnel and credible credentials; contributors to innovation; attractors of international talent and business investment; agents of social justice and mobility; contributors to social and cultural vitality; and determinants of health and well-being (Boulton, 2009). This is asserted by World Bank/UNESCO (2002) report: 'As knowledge becomes more important, so does higher education'.

The contribution of identifying useful output of university or higher education institutions has become a relevant topic in many countries. It is generally acknowledged that the science system has to contribute to economic

growth. Over the past few years more attention has been dedicated to the accountability of university research. In this general context, demonstrating usefulness of university research is an area that has aroused some interest and received considerable attention (Meyer, 2003). On the other hand, the rise of university patenting and strengthening of intellectual protection worldwide has spurred new start-ups, scholarly analysis and additional university funding for research. Investigations of university intellectual property have ranged from textual exegesis of matched scientific publications and patents (Myers 1995) to sophisticated econometric analyses of the total factor productivity of university licensing endeavors (Thursby & Thursby, 2002).

In 2015, Thomson Reuters, a major multinational mass media and information firm founded in Toronto, Canada and based in New York City and Toronto conducted a study and rank the worlds' top 100 innovative universities using a methodology that employs 10 different metrics. The criteria focused on different papers, which indicate basic research performed at a university, patent filings, which point to an institutions' interest in protecting and commercializing its discoveries. Another criteria was that these universities have the most reliably produce original research, created useful technology and have the greatest economic impact. Thomson Reuters' most innovative university is Stanford University which is located at the California's Silicon Valley where faculty and alumni have founded some of

the biggest tech companies in the world, including Hewlett-Packard, Yahoo and Google.

According to a study in 2012, Stanford University generate a total global revenue of $2.7 trillion annually from all companies formed by Stanford entrepreneurs. Moreover, only one university from Asia made it to top 10, the Korea Advanced Institute of Science and Technology (KAIST), the only non-US university to place in the top ten. Also, half of the most innovative universities hailed from the United States of America while the other half are sprinkled around the globe (Reuters, 2015). In another study conducted by the World Intellectual Property Office (WIPO) also in 2015, major telecom companies from China and the United States filed the most number of patent applications overall and only one university makes it to the top 50 of global patent applicants (Jaschik, 2015). These literatures attest the importance of innovation not only in universities across the world but in major companies as well.

Thiveaud (2015) considers innovation as the lifeblood of the global economy. It is what drives the advancement of better technologies, improved medicine, streamlined services and most new products and solutions. Patent data are often used as indicators of university research and development output (Griliches, 1998). Patent documents contain descriptions of scientific and technical concepts as well as practical details of processes and apparatus. It also reflects developments of science and technology. It is widely accepted

that patent statistics are a reliable indicator of innovative activity. Therefore, it has become standard practice to use patent statistics for monitoring innovative activities and the development of new technologies.

The total number of applications filed across the world in 2013 is estimated to be 2.07 million, representing a 11% increase from the previous year and granted 956,644 patent, representing a 4% increase from 2012. China saw the greatest annual increase in filing of 26.4% and Korea in grants at 12.2% increase. On the other hand, the number of applications in the three major patent offices in the world increased by 40% between 1992 and 2002, which corresponds to a doubling the number of application at the European Patent Office (EPO) and United States Patent and Trademark Office (USPTO), and to 15% increase at the Japan Patent Office (JPO). These figures reflects the growing importance of patents in the economy (OECD, 2003).

In spite of the evidences of the benefits of patent and innovation, Philippines have remain below in terms of patent filings. Data collated from the Intellectual Property Office (IPOPHIL) showed that the country's patent system is still a work in progress, with the volume still low as compared to its neighboring countries and with the activities dominated by non-resident applicants, or foreign applicants who want to protect their inventions in the country. Invention patent filings from non-residents rose from 2,762 in 2005 to 3,255 in 2014 while patent filings from resident applicants slightly rose from 210 in 2005 to 334 in 2015. The total number only slightly rose from 2,972 in

2005 to 3,589 in 2014. Patent grants to non-residents were up from 1,638 in 2005 to 2,132 (2014) while patent grants to residents were up from 4 in 2005 to 27 in 2014. The total stood at 2,159 in 2014 from 1,642 in 2005. The utility model applications, on the other hand, rose up to 58% from 519 in 200 5to 893 in 2014 (WIPO, 2015).

The Philippines saw a slight rise in its patent filings in the last two years. This can be linked to the creation of Philippine Patent Libraries also known as Innovation Technology Support Office (ITSO) by the Intellectual Property Office of the Philippines (IPOPHL) in collaboration with World Intellectual Property Office (WIPO) and US Patent and Trademark Office (USPTO). The aims of the project are to 1) strengthen the institutional capacity of universities and research and development (R&D) institutions to conduct patent search, patent drafting and assistance in patent prosecution; and 2) increase innovative and inventive outputs manifested by increased patent filing in the universities and R&D institutions. To date, there are already 86 ITSO's in the Philippines including Samar State University. Also in 2012, IPOPHL established the Patent Protection Incentive Package (PPIP) also known as "Juan's Thousand Invention", a project component of the ITSO franchise that waives its fees for the first one thousand invention effective March 22, 2012 to December 20, 2013. Even with the waived fees, there was a small number who availed of the incentive package, hence the promo was extended until December 31, 2015. The incentive package ends with a total of

184 patent applications only where 18 of these are from Samar State University.

With the new hope of rise in the technology protection arena in the Philippines, the final step to maximization of generated technologies through technology transfer or licensing has remain a challenge. There have been very few success stories in terms of technology transfer in the Philippines. One of these is the license agreement between the Philippine Council for Health Research and Development (PCHRD) representing the researchers from UP-Manila for the manufacture of the "Lagundi pediatric syrup" and Pascual Laboratories.

Dority (2003) opined that the amount of research a university does each year directly impacts the amount of technology that can be transferred and later commercialized. The larger the research capacity of a university, the larger the commercialization capacity of a university. According to him, before a university can spin out products, or file patents, or even have invention disclosures, there must first be a critical mass of basic research by which innovation can flow. Furthermore, the author recommends the following steps so that technology transfer might flourish in a university: 1) increase market share in research; 2) speed the commercialization of technology arising from university research; and 3) promote local entrepreneurship.

The role of higher education institutions today is not just to educate our citizens, generate new knowledge through research or transfer knowledge for

the benefit of the society. Today, it include evaluation of technologies, IP training for researchers, IP protection, technology marketing, licensing negotiation entrepreneurship development, incubation of start-ups, administration of institutional IP policy and among others. More particularly, the focus of this study is to determine the scope, impact and performance of technology protection and licensing of higher education institutions in the Philippines.

Furthermore, with the ASEAN 2015, Philippines has faced contemporary challenges including building resilience to global economic volatility, maintaining competitiveness with the rise of China and India, promoting full and productive employment and mitigating excessive inequality (ASEAN 2015 Report, 2014). It is therefore important to find out the strength or weakness of higher education institutions in terms of our capability in technology protection and licensing to be able to meet these challenges.

Statement of the Problem

This study aimed to determine the scope, impact and performance of technology protection and licensing originating from Higher Education Institutions (HEIs) in the Philippines.

Specifically it sought answers to the following questions:

1. What is the profile of HEIs with respect to:

1.1 academic programs offered with patent or utility model applications;

1.2 status of accreditation;

1.3 accrediting agency;

1.4 number of full time faculty;

1.5 maximum teaching load of full time faculty;

1.6 R & D Budget;

1.7 IP Budget;

1.8 Existence of IP Policy

1.9 ITSO Franchisee?

2. What is the creation performance of public and private HEIs in terms of:

2.1 number of patent and utility model applications;

2.2 number of technology field according to WIPO Classification?

3. What is the administrative performance of public and private HEIs in the Philippines in terms of:

3.1 number of patent and utility models examinations

3.2 number of PCT international search reports?

4. What are the utilization performance of public and private HEIs in the Philippines in terms of number of patents/utility models in force?

5. What is the licensing performance of public and private HEIs in the Philippines?

6. What is the innovation ecosystem in the public and private HEIs in the Philippines?

7. Is there a significant relationship between the profile variates of the public and private HEIs and their technology protection and licensing performance in terms of:

   6.1 creation capacity;

   6.2 administrative performance;

   6.3 utilization performance;

   6.4 licensing performance

   6.5 innovation ecosystem?

7. Are there significant relationship among the different performance indicators for measuring the performance technology protection and licensing of public and private HEIs?

8. What are the problems encountered by public and private HEIs in protection of their technologies generated?

9. What strategic technology protection and licensing management plan for higher education institutions (HEIs) for both private and public in the Philippines may be recommended?

Hypotheses

Based on the foregoing problems, the following hypothesis were formulated:

1. There is no significant relationship between the profile variates between public and private higher education institutions (HEIs) and their technology protection and licensing performance in terms of:

6.1 creation capacity

6.2 administrative performance

6.3 utilization performance

6.4 licensing performance

6.5 innovation ecosystem

2. There are no significant relationship among the different performance indicators for measuring the performance of technology protection and licensing of public and private higher education institutions (HEIs).

Theoretical Framework

The present study is anchored on the four (4) economic theories of patents as cited by Nelson and Mazzoleni (1996). These theories are the Invention-Inducement Theory (Arrow, 1962, Nordhaus, 1969 and Scherer,1972); Disclosure Theory (Green and Scotchmer ,1995)); Development and Commercialization Theory (Mazzoleni and Nelson,1998); and Prospect-

Development Theory (Kitch, 1977). These four theories are not necessarily mutually exclusive. However, they differ in the assumptions under which inventions are made, developed or commercialized.

The invention-inducement theory is the most familiar theory of the benefits of patenting. Much discussion about the benefits of patents proceeds as though motivating useful invention were the only social purpose served by patents and patents always serve this purpose. The social benefit of a particular invention is strictly its final use value; the social benefit of patent protection, stems, therefore, from the additional invention induced by the prospect of a patent. Hence, the social cost of a patent is the restriction on the use associated with the monopoly power lent by a patent. That formulation of the invention-inducement theory leads naturally to analysis of optimal patent defined as duration (Norhaus 1969; Scherer 1972), or breadth (Klemperer, 1990) and the tradeoff between the amount of increased invention induced but greater patent strength and the increased costs to society associated with the stronger monopoly position of the patent holder (Gilbert and Shapiro, 1990). The authors believe that in the optimal patent system, the wider the breadth of the patent, the higher the innovator's profit. In addition, Lerner (1994) shows how the breadth of patent protection significantly affects valuations. Broad patents are more valuable when there are a lot of substitutes in the same product class. This theory supports the present study inasmuch that universities should be able to benefit or getting value from its patents wherein

the value of patents depend on degree of protection associated with a certain invention and scope of protection.

The invention-inducement theory relates to the present study inasmuch as it seeks to find out the patent performance of higher education institutions in the Philippines. In most higher education institutions, the most potent cause affecting the amount of invention is clearly the rate of growth of scientific knowledge or the rate of research activity. However, the opportunities for profit-making and government measures designed to rewards inventors could also provide a stimulus to invent.

Green and Scotchmer (1995) provide a theoretical model of the impact of technical non-obviousness and disclosure on the value of patents. This is the Disclosure Theory. The authors pointed out that by disclosing technical information, this might be rather advantageous to a patentee's competitors and, as result of that, the patentee might prefer trade secrets to patents. The value of the patent may also depend on the overall value of the patent portfolio, or on the role that this patent plays in the portfolio. The disclosure theory stands on the belief that patents facilitate wide knowledge about and the use of inventions by inducing inventors to disclose their inventions when otherwise they would rely on secrecy. It presumes that secrecy is possible and sufficient to induce invention but that society is better off granting intellectual property rights and getting disclosure in exchange. A patented invention would thus be available for uses that the inventor did not know about or was

not in a position to implement. Under this theory, a patent both advertises the presence of an invention and facilitates licensing.

It is essential that inventors disclose their invention. The same is true that all invention or innovations of higher education institutions should be disclose otherwise it will not be protected and patent system may not be implemented. The disclosure represents the first official recording of the invention and can establish an irrefutable date and scope of invention. The disclosure in the patent system is critical for the advancement of science and technology. It is essential therefore that employees be aware of and follow the institutions' policy for duty to disclose an invention or technology. Hence, a policy for disclosure of invention for institutions is very important.

This study is also anchored on the development and commercialization theory. It is the theory that patents induce the investment needed to develop and commercialize inventions. The development and commercialization of inventions seems to be a variant of the invention-inducement theory, but with patenting occurring early in the process of inventing and with much additional work needed before the crude "invention" is ready for actual use (Mazzoleni and Nelson, 1998). The development and commercialization theory was widely cited in the discussions that led to the Bayh-Dole act, which gave universities the patent rights on inventions that emanated from their government-funded research projects. The Bayh-Dole Act of 1980 created a uniform patent policy among the many federal agencies funding research.

As a result of this law, universities retain ownership to inventions made under federally funded research. In return, universities are expected to file for patent protection and to ensure commercialization upon licensing. The royalties from such ventures are shared with the inventors; a portion is provided to the University and department/college; and the remainder is used to support the technology transfer process. Under the version of the development and commercialization theory most clearly articulated in the discussion that led to the Bayh-Dole act, a company would be unlikely to engage in development of a university invention unless it held proprietary rights. If universities held strong patent rights, they would be in a position to sell exclusive licenses. In contrast, if there were no patents, or if the government held them with a commitment to nonexclusive licensing, companies would be unlikely to invest in the necessary development work. This theory supports the present study in the context of the development and commercialization of patents. Universities should be able to generate profits through commercialization, either through sale of products, sale of the actual patents, profits from royalties from licensing or from cross-licensing agreements. Hence, the present study seeks to find out the technologies of higher education institutions that are already in the knowledge-based industries.

Edmund Kitch (1977) proposed a prospect-development theory of the societal benefits of patents. The prospect-development theory is concerned

with achieving efficiency in coordination with research and development by the elimination on inefficient competitors. According to him, a wide patent should be granted initially that would extend to protect subsequent improvements, or refinements of the invention. He assumed that there is an abundance of appropriable inventions to be made by using the initial invention as input but suggested that it is problematic. That is, many inventors share knowledge and see the same potential inventions, and they know that their competitors also see them, so there is a lot of racing for specific targets of opportunity and general overfishing in the prospect pond. Thus, a broad patent on the initial invention is necessary if the "mining of the prospect" or the "fishing of the pool" is to proceed in a less-wasteful, less-duplicative fashion.

The prospect-development theory suggests that an important issue defining the benefits and costs of granting patents on broad prospects is what is assumed about the market for patent licenses. In higher education institutions, patents should enable the orderly exploration of broad prospects for derivative inventions. HEIs should also be able to know what technological advances within a prospect to pursue.

These four theories have brought impact in the pursuit of this research and had provided direction to the present investigation.

Conceptual Framework

The Conceptual Framework is shown in Figure 1 and was designed to meet the objectives of the study. The constructs in the conceptual framework were defined from the objectives of the study and the literature review mentioned. The diagram depicts the map of the study which also shows the research process. As indicated in the first box, the Higher Education Institutions (HEIs) in the Philippines served as reference of the desired information to achieve expected outcome of the study. The technology protection performance of higher education institutions in the Philippines were determined with respect to the following indicators: 1) creation performance which refers to the number of patent and utility model applications and number of technology fields according to WIPO classification 2) administrative performance; 3) utilization performance which refers to the number of patents and utility model in force; 4) licensing performance which refers to the number of technology in the knowledge-based industry and 5) innovation ecosystem in terms of HEI support.

The expected outcome of the study is a strategic technology protection and licensing management plan for higher education institutions in the Philippines.

Significance of the Study

This study was designed to assess the technology protection and licensing performance of higher education institutions (HEIs) in the

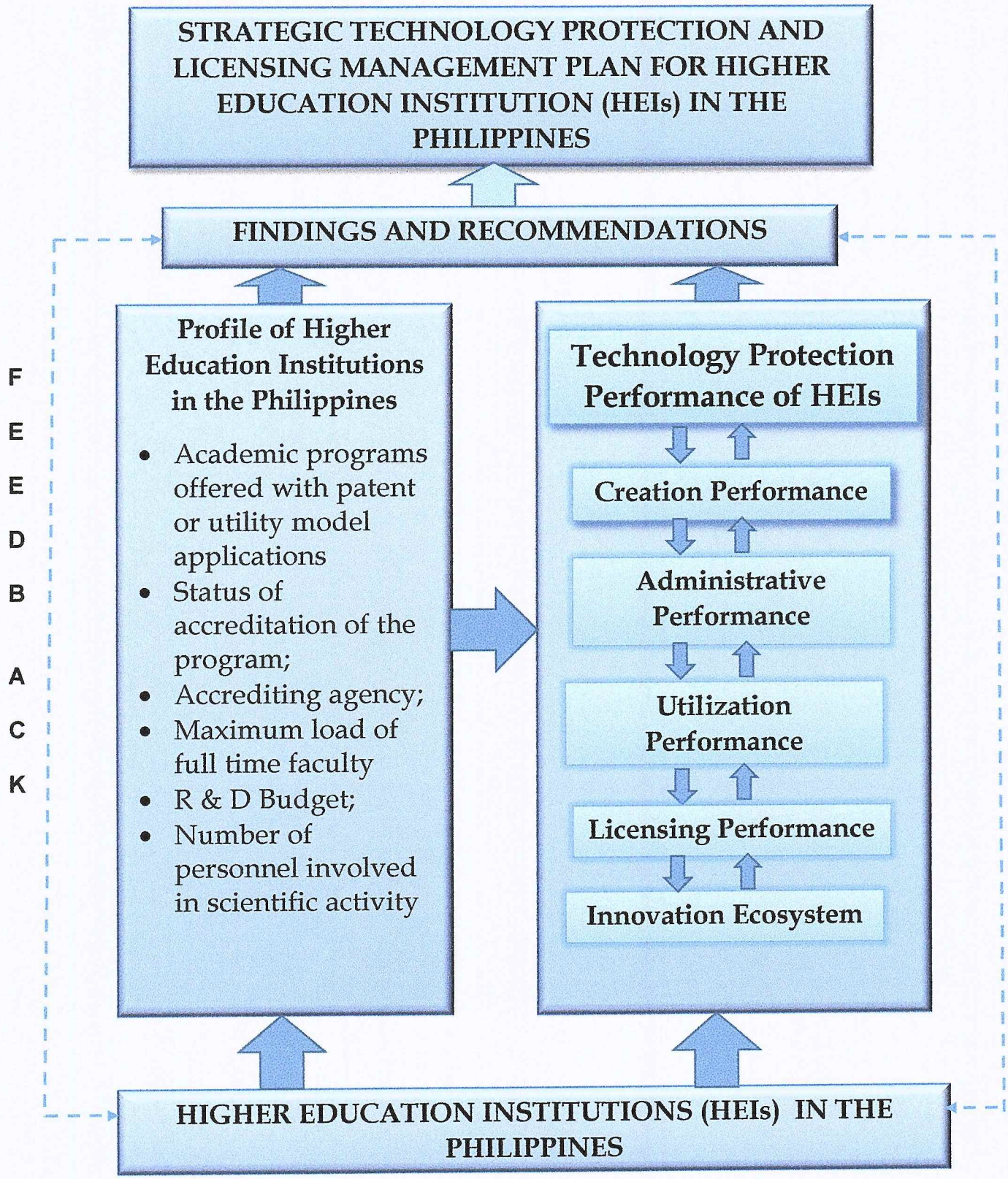

Fig. 1 Conceptual Framework of the Study

Philippines. The researcher believes that this study would be beneficial to the following:

Faculty Researchers. The faculty researchers of Higher Education Institutions (HEIs) would be aware of the performance of its institution and other institutions in the Philippines with respect to technology protection and licensing. It will enable them to have an active role in decisions regarding IP management within the college or university. This will have an impact on the direction that a faculty provides to his/her students on Intellectual Property programs and his/her work as a researcher.

Student Researchers. Student and student researchers would be able appreciate the importance and benefits of protecting their technology/ies. It will enable them to understand their role in achieving the goals of the institution in terms of producing technologies as well as protecting their technologies.

Administrators. The administrators would be aware of the importance of innovation and its role in economic development. The strategic technology protection and licensing management plan will serve as inputs in the decision making process in terms technology protection and support. Moreover, the findings of the study would also serve as inputs in setting-up goals and vision in achieving for a world-class university.

Higher Education Institutions. The results of the study will provide important information that will enable colleges and universities become active in protecting and exploiting their intellectual property. Since the creation and dissemination of knowledge is at the heart of every higher education institution activity, it is also a major duty to protect its creations. The results of the study can also serve as input for policy-making to improve the performance of higher education institutions in the Philippines in terms of technology protection and licensing.

Intellectual Property Office of the Philippines (IPOPHL). The findings of the study will provide important information on the prominence of technology protection and licensing performance of HEIs in the country. Hence, the results of the study will serve as inputs in its goals in improving the Innovation Index of the country.

Government Funding Institutions. The findings of the study will provide Department of Science and Technology (DOST), Commission on Higher Education (CHED) and other government funding agencies necessary and vital information on the current state and challenges faced by higher education institutions in the Philippines with regards to innovation and technology licensing. This will also serve as an eye-opener on the areas needed for possible funding aimed at increasing Filipino innovations for the benefit of the government and the public.

Scope and Delimitation

This study focused on the technology protection and licensing performance of higher education institutions (HEIs) in the Philippines who are submitting patents and utility models for protection or those who already have registered patents and utility models at Intellectual Property Office of the Philippines (IPOPHL) or filed in Patent Offices outside the country such as United States Patent and Transfer Office (USPTO). It included both public and private HEIs in the Philippines. The respondents of the study were those who have knowledge on research activities and technology protection of HEIs. These include the President/Head, Vice President/Vice Chancellor for Research, Research Director, IP Personnel and Faculty researchers of the higher education institutions. At the initial stage of data collection, random sampling was used in choosing its respondents. Online survey questionnaires were sent-out to all private and public HEIs in the Philippines. However, only those who have access to the internet, HEIs with active websites and emails were included in the study. Eventually, in finding the utilization performance of HEIs, purposive sampling was used. Top performing HEIs that came out in the technology protection and licensing performance were visited and interviewed for an in-depth analysis on the leading performer both in technology protection and utilization.

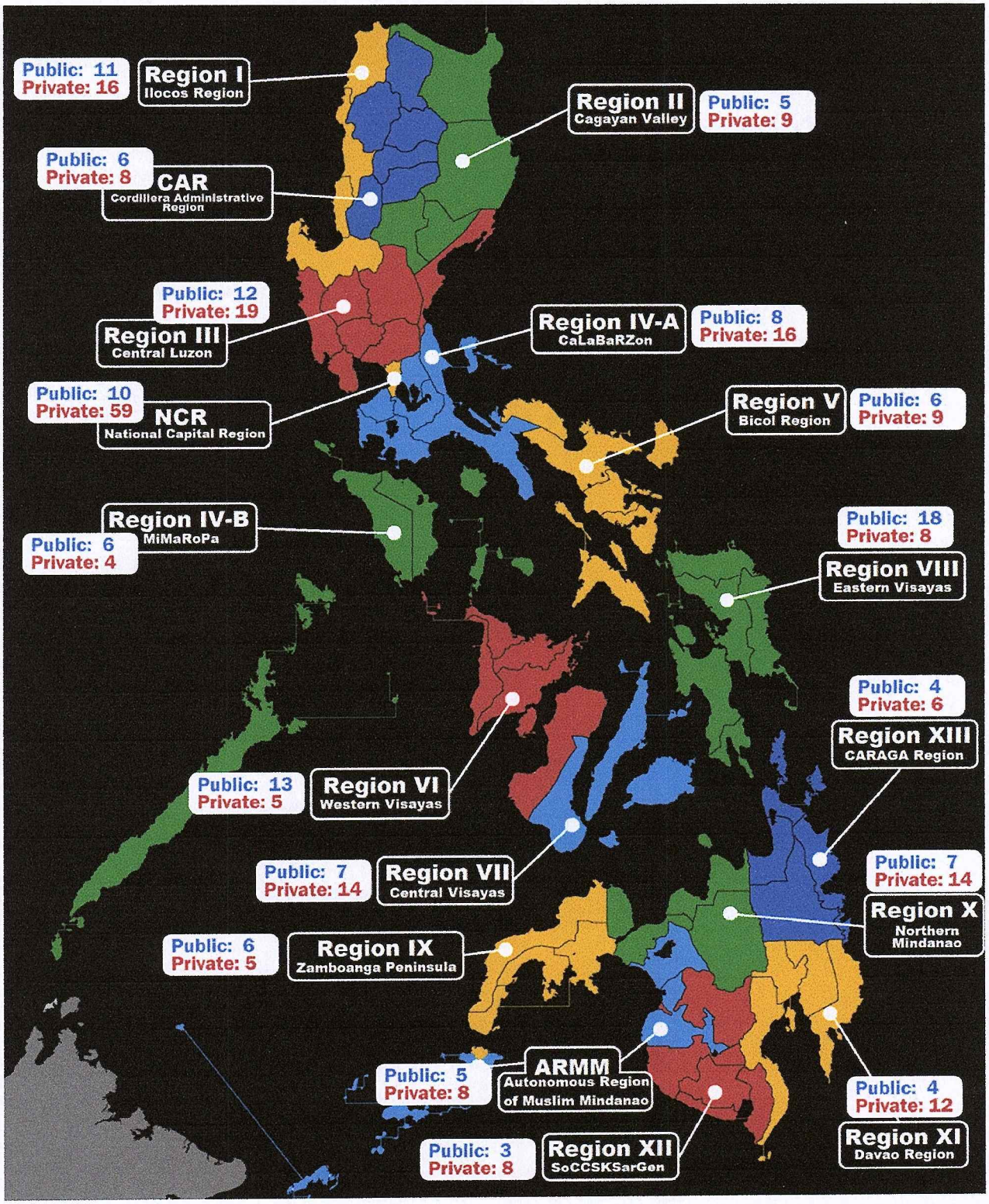

Figure 2. Map of the Philippines showing the distribution of HEIs by region

The respondents of the study were the faculty researchers, inventors, higher education institutions heads/presidents, vice presidents or vice chancellor for research, research staff, the research directors, Innovation Technology and Support Office (ITSO) managers, intellectual property administrators and staff of the higher education institutions (HEIs) who are involved in the protection and licensing of their technologies.

The study was conducted during the school year of 2016-2017.

Figure 2 shows the map of the Philippines showing the distribution of HEI respondents from different regions in the country.

Definition of Terms

The following terms are defined operationally and technically to facilitate better understanding of this study:

Autonomous Higher Education Institutions. This term refers to private higher education institutions that demonstrate exceptional institutional quality and enhancement through internal QA systems, and demonstrate excellent program outcomes through a high proportion of accredited programs, the presence of Centers of Excellence and/or Development, and/or international certification. In particular, they show evidence of outstanding performance consistent with their horizontal type such as research and publication for universities; creative work and relevant extension programs for colleges, and employability or linkages for

professional institutes (CMO No. 46, Series of 2012). As used in the study, this term refers to 55 private higher education institutions' respondents that are evaluated as autonomous.

Creation. This term refers to an act of making or producing that did not exist before (Merriam-Webster Dictionary, 2015). As used in the study, this term refers to the number of patent and utility model applications and number of technology fields applied by a higher education institutions in the Philippines.

Copyright. The right of authors of literary and artistic works (such as books and other writings, musical compositions, paintings, sculpture, computer programs and films) are protected by copyright, for a minimum period of 50 years after the death of the author (WTO, 2016).

Commercialization. This term refers to the attempt to profit from innovation through the sale or use of new products, processes, and services. The term is usually used with regard to a specific technology to denote the process of incorporating the technology into a particular product, process, or service to be offered in the marketplace The term commercialization therefore emphasizes such activities as product/process development, manufacturing, and marketing, as well as the research that supports them, More than invention or Innovation, commercialization is driven by firms' expectations that they can gain a competitive advantage in the marketplace for a particular product, process, or service (US Office of Technology Assessment, 1995). As used in this study, this

term refers to the organizational climate and institutional support regarding to innovation.

Deregulated Higher Education Institutions. This term refers to private higher education institutions that demonstrate very good institutional quality and enhancement through internal QA systems, and demonstrate very good program outcomes through a good proportion of accredited programs, the presence of Centers of Excellence and/or Development, and/or international certification. In particular, they show evidence of very good performance consistent with their horizontal type (CMO. No. 46, Series 2012). Operationally, this term refers to 11 private higher education institutions' respondents.

Environment. This term refers to the complex of physical, chemical and abiotic factors that act upon organisms or an ecological community and ultimately determine its form and survival (Miriam-Webster Dictionary, 2015). Operationally, this is one of the indicators to determine the performance of Higher Education Institutions in technology protection. It will show how encouraging the conditions are inside the HEIs, and the Philippines, where an inventor or maker can file, register and maintain their IP rights.

Higher education institutions (HEIs). This term refers to tertiary institutions that are either colleges or universities, private or public and are licensed controlled and supervised by Commission on Higher Education (CHED). As used in the study, this term refers to all tertiary institutions that

are submitting patent and utility model for protection. Operationally, this term refers to 351 higher education institutions' respondents form both public and private entity.

Intellectual property (IP). This refers to creation of the mind, such as inventions; literary and artistic works; and symbols, names and images used in commerce (WIPO).

Intellectual Property Office of the Philippines. The Intellectual Property Office of the Philippines (IPOPHL) is the lead agency responsible for handling the registration and conflict resolution of intellectual property rights. It was created by virtue of Republic Act No. 8293 or the Intellectual Property Code of the Philippines, which took effect on January 1, 1998 under the presidency of Fidel V. Ramos (IPOPHIL).

Intellectual property rights (IPR). This refers to the general term for the assignment of property rights through patents, copyrights and trademarks. These property rights allow the holder to exercise a monopoly on the use of the item for a specified period (OECD, 2005).

Innovation. This terms encompasses both the development and application of a new product, process, or service. It assumes novelty in the device, the application, or both. Thus, innovation can include the use of an existing type of product in a new application or the development of a new device for an existing application. Innovation encompasses many activities, including scientific, technical, and market research; product, process, or service

development; and manufacturing and marketing to the extent they support dissemination and application of the invention (US Office of Technology Assessment, 1995).

Innovation ecosystem. This term is used to describe the large and diverse array of participants and resources that contribute to and are necessary for ongoing innovation in a modern economy. This included entrepreneurs, investors, researchers, university faculty, venture capitalists as well as business development and other technical service providers such as accountants, designers, contract manufacturers and providers of skills training and professional development (MassTech Collaborative, 2016)

Invention. An invention is a new composition, device, or process. Invention can also be defined to include creative endeavors that extend beyond original, substantial improvements. An invention is also a new, useful, and nonobvious improvement of a process, machine, or product. Any invention which is new, useful, and nonobvious improvement of process can be patented. Inventions that involve processes, machines, manufactures, and compositions of matter, and any improvement thereof, are patentable (WIPO, 2012)

Inventor. The term "inventor" means the individual or, if a joint invention, the individuals collectively who invented or discovered the subject matter of the invention (US Code, 2012).

Licensing. This term refers to exploitation of intellectual property including the commercialization of research results generated in universities and

public funded research institutions (WIPO, 2015). As used in this study, this term refers to the number of technology of higher education institutions that are in the knowledge-based industry.

Patent application. This term refers to the documentation submitted by an inventor as a request to be the sole owner of an idea or invention's patent. The application will include elements of a patent which may also be modified during the application process approval (www.ipophil.gov.ph).

Patent Library. Also known as the Innovation Technology Support Office (ITSO) is a joint project of Intellectual Property Office of the Philippines (IPOPHL), World Intellectual Property Office (WIPO) and United States Patent and Trademark Office (USPTO) that aims to 1) strengthen the institutional capacity of universities and research and development (R&D) institutions to conduct patent search, patent drafting and assistance in patent prosecution; 2) increase accessibility by universities and R&D institutions to patent information; and 3) increase innovative and inventive outputs manifested by increased patent filing in the universities and R&D institutions (www.ipophil.gov.ph).

Patent. A patent is an exclusive right granted for an invention, which is a product or a process that provides a new way of doing something, or offers a new technical solution to a problem (WIPO Publication No. L450PA/E).

Regulated Higher Education Institutions. This term refers to private higher education institutions which still need to demonstrate good institutional

quality and program outcomes (CMO NO. 46, Series 2012). As used in the study, this refers to 156 regulated higher education institution respondents.

Scientific activity. This term refers to a predominantly durable, targeted, structured, organized, individual or collective activity, having a form of investigation and cognition. A necessary condition of a scientific activity is its actual novelty in the sense of acquiring a novel piece of knowledge, completion of an existing knowledge with new facts, targeted effort for a creative seeking of new pieces of knowledge, application of scientific methodology in the investigation verity of the acquired piece of knowledge conformed by testing processes, of a scientific hypothesis, reproducibility of results of cognitive processes and approval of the community of scientists that the investigative processes or their results in the form of pieces of knowledge can be considered as scientific (Premysl and Jiri, 2012). Operationally, scientific activity refers to an organized investigation done by higher education institutions to acquire new knowledge, protect and commercialize said new knowledge.

SUC Levels. This term refers to the classification earned by any State Universities and Colleges (SUC) after undergoing evaluation using the 2013 SUC Leveling Scheme. SUC Level IV are those SUCs that are good in undertaking the full range of functions of a state university/college, namely instruction, research and extension as manifested through demonstrated teaching effectiveness, research competence, active community service and

efficient management of resources. SUC Level III are those SUCs that are effective in undertaking the functions of a state university/college but fall short of the qualities of a Level IV SUC. SUC Level II on the other hand, are those SUCs that are still in the early stages of their development while SUC Level I are all other SUCs that do not meet the minimum percentage points in each KRA for Level II SUC (DBM and CHED Joint Circular No. 1-A, Series 2003).

Technology. This refers to the use of science in industry, engineering, etc., to invent useful things of to solve problems (Merriam-Webster Dictionary, 2015). Operationally, technology are those creation produced by higher education institutions being protected at any Patent Office such as the Intellectual Property Office of the Philippines (www.ipophil.gov.ph).

Technology protection. This term refers to technology or intellectual assets registered at the Intellectual Property Office of the Philippines (www.ipophil.gov.ph). Operationally, this term refers to the university intellectual asset submitted to IPOPHIL as patent or utility model.

Utility Model. A utility model is similar to a patent in that it provides a monopoly right for an invention. However, utility models are much cheaper to obtain, the requirements for grant of a utility model are usually less stringent and the term is shorter (Dehns, 2010). In the Philippines, utility models lasts for 7 years. Utility models are sometimes referred to as "petty patents" or "innovation patents.

Utilization. This refers to make use of or turn to practical use or account (Merriam-Webster Dictionary). Operationally, this term refers to the actual performance of HEIs in terms of technology protection. These refers to the registered patent and utility model that are used by industries.

WIPO International Classification. It is an international system that is used to classify patents and utility models according to the different areas of technology to which they pertain. The IPC was established by the Strasbourg Agreement in 1971 and is continuously revised by the IPC Committee of Experts (www.wipo.com).

Chapter 2

REVIEW OF RELATED LITERATURE AND STUDIES

This chapter presents the discussion of the related literature and studies contained in publications such as published books, journals and other relevant information that provided substantial background of the problems considered in the study. The ideas and knowledge acquired through these readings have brought insights in its conceptualization.

Related Literature

Innovation is about application of ideas, discoveries and inventions. The foundation for innovation is the steady supply of excellent ideas, ingenuity and creativity, and combined with the constant exchange of ideas between academics and industries, government and non-government (www.cam.ac.uk). But what makes a world-class university? This is one of the important questions that Salmi (2009) addressed in his book entitled "The Challenge of Establishing a World Class University". Salmi (2009) examines the power of tertiary education for development from the perspective of excellence in research and scholarships at its most competitive levels. The highest-ranked universities according to him are the ones that make significant contribution to the advancement of knowledge through research, teach with the most innovative curricula and pedagogical methods under the most conducive circumstances, make research an integral

component of undergraduate teaching and produce graduates who stands out because of their success in intensely competitive arenas during their education and after graduation. Moreover, becoming a world-class university is not achieved by self-declaration nor it will happen overnight. A long-term vision for creating world-class universities— and its implementation—should be closely articulated with (a) the country's overall economic and social development strategy, (b) ongoing changes and planned reforms at the lower levels of the education system, and (c) plans for the development of other types of tertiary education institutions to build an integrated system of teaching, research, and technology-oriented institutions.

The establishment of a world-class university requires, above all, a strong leadership, a bold vision of the institution's mission and goals, and a clearly articulated strategic plan to translate the vision into concrete targets and programs. Therefore, world-class universities are recognized for their superior outputs, they produce well-qualified graduates who are in high demand on the labor market; they conduct leading-edge researches published in top scientific journals and they contribute to technical innovations through patents and licenses.

Technological innovation is represented by the conversion of knowledge into new products and processes which, when commercialized, generate wealth. It occurs mainly when firms create, through research and development (R&D), new products or processes (Winter, 1988). But, in order for a firm to gain

advantage over competitors, technological advances should happen at the knowledge frontier, originating from state of the art scientific and technological research (Dosi, 1988).

A multitude of economic studies have shown the importance of basic research for technology, innovation and economic growth (e.g. Allen, 1977; Tushman, 1977; Tushman & Katz, 1980; Jaffe, 1989, Adams, 1990, Narin et al 1997, Griliches, 1998, Rosenberg & Nelson 1994; Mansfield, 1995; Henderson et. al. 1998; Branscomb et al., 1999, Cohen et al 2002). The technology management literature has documented the process of how scientific knowledge feeds into successful innovations and consequent economic growth mainly on the basis of specific case studies and detailed surveys at the firm-level (e.g. project Hindsight, 1958, project TRACES, 1967; Tushman, 1977; Tushman & Katz, 1980; Bud, 1994; Hills, 1997).

As Paul Romer, one of the world's leading experts on economic growth, has written,

> *"The knowledge needed to provide citizens of the poorest countries with a vastly improved standard of living already exists in the advanced countries. If a poor nation invests in education and does not destroy the incentives for its citizens to acquire ideas from the rest of the world, it can rapidly take advantage of the publicly available part of the worldwide stock of knowledge. If, in addition, it offers incentives for privately held ideas to be put to use within its borders (for example, by protecting foreign patents,*

copyrights and licenses, and by permitting direct investment by foreign firms), its citizens can soon work in state-of-the-art productive activities."

The Global Institute of Intellectual Property (GIIP, 2008) opined on the significance of intellectual property that creativity and innovation are the new drivers of the world economy. Within knowledge-based, innovation-driven economies, the intellectual property system is a dynamic tool for wealth creation that will provide incentive for enterprises and individuals to create and innovate; a fertile setting for the development of, and trade in intellectual assets; and a stable environment for domestic and foreign investment. Intellectual property (IP) contributes enormously to our national and state economies (GIPC, 2012). On the other hand, Global Intellectual Property Center (2012) enumerates the importance of IP: One, intellectual property creates and supports high paying jobs. IP-intensive industries employ over 55 million Americans, and hundreds of millions worldwide and earns about 30% more than his counterpart in a non-IP industry; second, intellectual property drives economic growth and competitiveness. America's IP is worth $ 5.8 trillion, more than the nominal GDP of any other country in the world. Third, strong and enforced intellectual property rights protect consumers and families. Strong IP rights help consumers make an educated choice about the safety, reliability and effectiveness of their purchases. It also ensures that products are authentic, and of high quality that consumers recognize and expect. Fourth, intellectual property helps generate

breakthrough solutions to global challenges. Nearly all of the hundreds of products on the World Health Organization's Essential Drug List, which are critical to saving or improving people's lives around the globe, came from the R&D-intensive pharmaceutical industry that depends on patent protections. Innovative agricultural companies are creating new products to help farmers produce more and better products for the world's hungry while reducing the environmental impact of agriculture. IP-driven discoveries in alternative energy and green technologies will help improve energy security and address climate change. Lastly, intellectual property rights encourage innovation and reward entrepreneurs. IP rights incentivize entrepreneurs to keep pushing for new advances in the face of adversity. It also facilitate the free flow of information by sharing the protected know-how critical to the original, patented invention. In turn, this process leads to new innovations and improvements on existing ones.

Hall (2001) studies the theoretical and empirical evidence on the relationship between the strength of patent protection in a country and technology transfer of various kinds. The results of the research surveyed can be summarized as follows: first, stronger patents encourage patenting in general, and they encourage technology transfer of all kinds to mid-level developing countries and to developed countries. However, they have little effect on technological transfer to the lowest income countries. Further, he concluded that it was difficult to find clear evidence of positive impacts of stronger patents on innovation, except in chemical-related sectors.

While intellectual protection is very important, Villasenor (2012) conducted a survey entitled "Intellectual Property Awareness at Universities: Why Ignorance Is Not a Bliss?" to graduate engineering students of University of California, Los Angeles. Results of the survey revealed that of the approximately 60 graduate engineering students, 68% stated that they do not know enough to answer the question "what is a trade secret?", 21% stated that they do not know enough to answer "what is patent?". The percentages of students unable to provide an answer to "what is copyright?" and "what is a trademark?" were 32% and 51% respectively. He concluded that universities need to do a better job at preparing their graduates to be productive citizens of the innovation economy, and that includes giving more attention to IP education.

Mutschler and Graff (2007) presents basic information that any scientists whether faculty or graduate students should know about intellectual property. According to them, a working understanding of intellectual property (IP) is needed to realistically evaluate and manage IP issues and make informed decisions, from starting and running programs to deciding how best to handle the resulting inventions. Lack of basic information regarding IP and technology transfer issues can result in problems that are costly in terms of time, opportunity and money. Therefore, faculty and staff must take an active role in decisions regarding IP management. This will have an impact on the directions faculty provide to undergraduate and graduate students, postdoctoral fellows. For graduate students and post graduate fellows on the other hand, obtaining a basic

understanding of IP is an important part of their training, whether for future career in government, academia or industry. Basic IP training is important to how they will proceed in their own research.

In similar analysis, Baylor University (www.baylor.edu) presents four important reasons why patent law is important to a university researcher. First, a "research exception" has been recognized as a limit on a patent's effectiveness. Generally, patents covering a technology do not limit academic research on that technology. Thus, patenting has been assumed not to prevent academic research by the inventor or by anyone else in the academic research community. Second, historical experience has shown that ideas which are not patented—which are instead "dedicated to the public"—tend not to be developed commercially. This is because few commercial businesses will invest the millions of dollars frequently required to develop a university-originated idea into a commercial product unless there is a sufficiently long period in which that investment can be recovered from a "protected" market. Thirdly, commercial development of practical ideas has become more essential to the economic wellbeing of the nation and the state; the economic dominance once enjoyed by American companies continues to be eroded by nations more adept at commercializing new ideas—in many cases, new ideas which originated in the U.S. but were not protected through patenting. Keen competition for federal research grants has increased the importance of industrial research funding, which usually requires the resulting technology to be patent protected.

The creation and dissemination of knowledge is at the heart of every university activity. The challenge is realizing how this knowledge can best be utilized as an asset that can provide the maximum value to the economy, society and the university itself (Smith, 2015). There are three main roles for IP in the university business model according to Smith, and all universities need to consider these roles within their own mix of disciplines, and their own business model, and to align their policies and procedures. The emphasis placed on these roles in order to optimize the benefits that can arise from them is likely to differ from institution to institution to reflect the individual nature of the institution's business model. These roles are: maintaining freedom to operate; translating knowledge with immediate application; and creating and managing new knowledge. Universities must ensure that they protect their own freedom to operate. For example, policies are needed to manage IP in teaching materials in order ensure continuity following departure of an academic, or to ensure that a researcher can publish his research. Universities accumulate and integrate state of the art knowledge in the fields in which they operate and then transfer this knowledge, for example through teaching, providing continuing professional development and research. The effective protection of any proprietary teaching models and materials and research results needs to be considered in order to support the most effective transfer of such knowledge. Knowledge without knowledge transfer is of no value to organizations established with a good public motive.

Making universities and other public research organizations more active in protecting and exploiting their IP means not only actively promoting faculty and student research, but also determining how best to pursue any relationship with business clients while protecting the public interest. Encouraging universities to commercialize research results by granting them title to IP can be useful but it is not sufficient to get researchers to become inventors. The key is that institutions and individual researchers have incentives to disclose, protect and exploit their inventions. Incentives can be "sticks" such as legal or administrative requirements for researchers to disclose inventions. Such regulations are often lacking in many countries, even in those where institutions can claim patents. Government rules that prevent universities from keeping royalty income from licenses are another disincentive to institutions. Incentives can also be "carrots" such as royalty sharing agreements or equity participation in academic start-ups. Recognition of patent activity in the evaluation and recruitment of faculty can also provide incentives for young researchers. Tsinghua University in China offers its young researcher's prizes for inventions that are commercialized (WIPO, 2003).

Many of the concerns or issues related to balancing IP protection with public access will take time to resolve. The growing reliance of public research institutions on various sources of funding, including from industry and contract research, as well as demands by society for greater economic and social returns on investment in public R & D, have made academic patenting a reality that is

more likely to increase than decrease. At the same time, it should be recalled that intellectual property is but one of several channels for transferring knowledge and technology from publicly funded research which include publication, the movement of graduates, conferences as well as informal channels. While research institutions and firms are working to find solutions to problems as they arise, government and research funding agencies have a role to play in providing guidelines on academic patenting and licensing and in fostering debate (Cervantes, 2003).

On the other hand, Meyer (2003) compares patent citation analysis with a different approach of tracking patents that are related to universities by their inventors rather than university ownership on Finnish academic and university-owned patents. The findings confirm Pavitt's (1998) skepticism about university-owned patents that patents owned by universities are not a solid indicator of the inventive output of academic researchers but also indicate that academic patents can be an alternative and less distorted measure of university researchers' contribution to technological development than patents owned by universities. However, Meyer believe that his study by sharing reasonable indicator of technological work by university scientists. This is illustrated in a significantly higher number of university-invented than university-owned patents.

All of the above literature showed the importance of intellectual property both in university and the country's economic growth. However, there is another side of intellectual property which according to Fisher may either stimulate or

impede technological progress. According to him intellectual-property rights have the following unfortunate side effects: First, they are costly to administer. The establishment and maintenance of patent registration systems, the staffing of courts to interpret and enforce entitlements, and the employment of lawyers first to obtain and then to protect entitlements – all of these things consume substantial social resources.

Second, intellectual-property rights sometimes impede cumulative innovations. Suppose Innovator #2 wishes to build upon the work of Innovator #1. The need to secure a license from Innovator #1 will, at a minimum, add to Innovator #2's costs. If, for some reason, Innovator #1 is unable or unwilling to grant the license, the work of Innovator #2 may be frustrated altogether.

Third, by empowering innovators to charge consumers more than the marginal cost of replicating their innovations, intellectual-property rights have the unfortunate effect of pricing some consumers out of the markets for the goods produced with those innovations. The result is a loss of the consumer surplus that otherwise might have been reaped by those consumers. However, Fisher (2001) suggested the following techniques to mitigate the economic side effects of intellectual-property systems: (a) compulsory licenses; (b) facilitation of price discrimination; (c) strict enforcement of the "utility" requirement; (d) encouragement of appropriate cross-licensing agreements; (e) narrow interpretations of "similarity"; (f) strict enforcement of "enablement" and "best-

mode" requirements; and (g) the affirmative defenses of patent and copyright misuse.

Saad, et. al in their paper entitled "Mapping the Diverse Roles of Universities in Supporting Innovation: Opportunities and Challenges for Algeria, Indonesia, Malaysia and India" investigated various opportunities as well as challenges facing universities from developing countries which is in their role of creation and exchange of knowledge as a basis of innovation. The paper intends to build a theoretical framework linking these universities with regional and/or national systems of innovation and their position within the three stages evolutionary process (statist, laissez-faire, hybrid) of the triple helix system (Etzkowitz, 2003).

This paper also argues that the challenges and opportunities for the universities to contribute to the innovation system would be contingent upon the position of universities in the framework. The Triple Helix model (Etzkowitz and Leydesdorff, 2000) can be seen as an approach that can help in analyzing the different types of interaction between those three key actors. The Triple Helix proposes three different regimes of interaction between the three key actors. In the Statist regime, government exercises control over academia and industry. In the Laissez-Faire regime, industry and academia are independent to government as well as to each other and the three actors are set apart from each other with minimal interactions. In the third regime, often called Hybrid, while institutional

spheres maintain their identity and often their independence, they can also take each other role.

The results of the study revealed that there are different patterns of university population diversities across various studied countries. Most of Algerian HEIs are under the control or direct supervision of Algerian government. Even though, there might be some trace of autonomy granted to these institutions, in general their contribution to innovation system would be as the result of government intervention into their research and teaching agenda. Meanwhile, Indonesia had a mix between Statist type of HEIs which are public and the "Laissez Faire" type of institutions which are mainly private. Only a small number of institutions have the capability to operate at the national level to contribute to the national system of innovation of the country. In Malaysia, even though the majority of its HEIs are either Federal or Regional State public owned institutions, some of them enjoy certain degree of autonomy to develop their own teaching and research agenda.

In another study conducted by Veugelers (2014) entitled "The contribution of universities to innovation, (regional) growth and employment", expressed that while teaching and research are the first and second stream of activities of universities, a third stream of activities is the contribution of universities to society by transferring their know-how. This third stream of activities builds upon the first and second, but it is increasingly being seen as important and distinctive in its own right, deserving of specific policies and resources to ensure

their effective functioning. He concluded that he evidence reviewed in his study clearly shows the important role universities can and do play in economies at wide and for their local economies in particular, managing to reconcile their first and second mission of teaching and exogenous driven research with their third mission of contribution to (local) economic development. The pathways through which these third mission activities of universities materialize are manifold. The mode which is most often looked at by researchers, policy makers and the wider community and where most data are available is academic patenting. Evidence on academic patenting is widely available. However, it clearly shows a growth over time, but at the same time it shows how concentrated the phenomenon is in few institutions, few technology areas and on few academic patents with high (licensing) value. The other most often looked at mode, the one of faculty spin-offs, has less well developed databases available, but also shows the same skewedness. The evidence also clearly shows the importance of geographic proximity for the effects of patenting and spin-offs to materialize.

With the growing importance of protecting intellectual property to reap its maximum benefits, there is also a growth in a university-industry partnerships. A study was conducted by Hall (2001) on the IP mechanism on research partnerships which suggested that the tradeoff between providing incentives for the production of new ideas and information and ensuring that spillovers from that research flow to others is likely to lead to different methods of organizing research efforts in different spheres depending on the relative

importance of "appropriability" versus the benefits of full and costless knowledge diffusion. There is a tension between the two worlds of commercial innovation and scientific research with respect to the twin goals of appropriating and diffusing knowledge.

Recent developments in the protection of Intellectual Property, especially in the U.S., together with the increasing closeness of public and university research to commercialization in several major research areas have heightened this tension, causing concern in the academic community and elsewhere that in the race to ensure that the incentives to create new forms of information such as databases and software are in place, we may have also slowed their diffusion in ways that will harm the very enterprise that was responsible for generating the innovations that underlie the IT revolution to begin with.

From an economic theory perspective, according to him, the policy question and remedy are relatively simple and not new: if society benefits from researchers having access to some forms of information at low cost, and there exists private sector willingness to pay for that information, then subsidies to researchers so that they can acquire the information would be socially beneficial, and at the same time, would leave the incentives to produce the information intact. Because private sector firms would still be charged the "market" price, these subsidies would not have to be as large as they would need to be if the government funded the entire activity.

In another study conducted by WIPO in 2007, technology transfer, intellectual property rights and university-industry partnerships as experienced by Japan, China, India, Philippines, Republic of Korea, Singapore and Thailand were examined. The study evaluates the recent progress made in these seven Asian countries towards more effective and mutually reinforcing relations between universities and industries in the field of scientific and technological research. Results of the study showed a marked increase in the number of patent applications filed by universities of Asian countries. National governments have enacted policies to promote university-industry technology transfer and various Asian universities have adopted formal intellectual property policies and established technology transfer offices to manage their intellectual property rights.

The study by WIPO (2007) concluded that there is a need for universities to adopt clear policies for protecting and managing IPRs is increasingly realized by Asian universities. Without a strong IPR policy, that provides clear rules and guidelines for the commercial exploitation of IP generated within the university, establishes ownership criteria and rules for income-sharing and defines responsibilities and obligations of all stakeholders, it will be difficult for universities to move forward in this field in a systematic manner. In some cases, problems arise from inadequate implementation of rules rather than the absence of rules. But on the whole, without clear guidelines and procedures, there is a risk of conflict between the different parties as the outcomes may not meet

expectations. In some of the Asian countries analyzed in the national studies, only few universities have formally adopted an IP policy, although in some cases, policies are currently being discussed or have been submitted to the relevant internal bodies for adoption.

A problem researchers or scientists often face is that of their lack of expertise in filing patent applications and negotiating agreements with industry. This raises a fundamental issue for all Asian countries and points to the strategic importance for universities to have a strong and effective office devoted to managing technology transfer staffed with legal and technical experts. Moreover, Asian governments place a high priority on ensuring adequate levels of funding for the activities of universities and public research institutions. Such research activities create a pool of knowledge and inventions, a resource that can be tapped for the purpose of U-I collaboration. In addition, there have been new types of funding in recent years, such as support for incubation facilities, science parks, and soft loans. In some countries, tax incentives have been adopted to encourage companies to utilize technologies developed by universities. In general, Asian universities have been given increasing amounts of funds for their research programs in the scientific and engineering fields.

The information of patent data can be used for strategic purposes. A study conducted by Ernst (2003) addresses how patent information can be used for competitor monitoring, technology assessment, R & D portfolio management, identification and assessment of potential sources for the external generation of

technological knowledge and human resource management. According to him, the value of patent information is greatly enhanced if the varying levels of a patent's quality is taken into account. The following indicators of patent quality was used in the study: (1) ratio of granted to filed patents; (2) international scope; (3) technological scope; and (4) citation frequency. Moreover, one of the most important decisions to be made in technology management is the investment of R & D resources; senior management must decide how much R&D resources will be spent on what type of technology. Strategic R&D investment decisions should not be solely based on technological considerations but they should also take market requirements into account.

A more successful alignment between R&D and market requirements can be achieved by integrating the patent portfolio with existing market portfolios. On human resource management, the inventor portfolio is a helpful tool for human resource management in R&D. Empirical research shows that key inventors are very rare in industrial R&D labs and that they contribute significantly to their firm's patenting output.

This study of Ernst (2003) concluded that patent data must be understood as a strategic information source, which contributes important information to the effective and efficient management of technology. This type of patent information addresses two major groups of recipients inside and outside the organization. First, it addresses decision makers from senior management inside the form who make strategic decisions on R&D budget. The strategic value of

patent information becomes evident in its contribution to better decision-making in relevant areas of the form. Second, strategic patent information addresses external stakeholders and analysts whose perception of the firm's technological competence can have a major impact on the firm's stock market performance. Further, the retrieval and evaluation of patent data should be institutionalized within the organization in order to ensure the continuous and systematic use of patent information in a company's decision-making processes. Patent information should become a core element of a firm's knowledge management system.

Another indicator for evaluating patent performance is presented by Ryu and Han (2011). A comprehensive patent performance indicator was proposed to provide a yardstick by which government policymakers can evaluate the whole process of converting patents into economic assets. The national patent performance indicator has been developed through three stages: in the first stage, 16 individual indicators were proposed according to hierarchal structure. In this makeup, four dimensions-creation, administration, utilization and environment were mainly considered. Next, each dimension was divided into quantity and quality domains in order to derive indicators in a more accommodating way; and finally, a composite indicator was proposed, by multiplying each indicator with the assigned weight.

The detailed steps include: opting for the dimensions that is, creation, administration, utilization and environment; proposing a composite patent

performance indicator by adopting the corresponding weights for each indicator; and finally demonstrating the differences between the proposed indicators and the previous count-based indicators. The three dimensions-creation, administration and utilization were divided into two-quality and quantity. According to Ryu and Han (2011), it is necessary to take quantity into account because in order to develop a new technology, the absolute amount of technologies has to reach a certain level. On the other hand, quality needs also emphasis because core technologies can create much more benefits than peripheral ones. In the case of environment, the dimension was divided into domestic support, which represents the nationwide infrastructure that upholds the creation, administration and utilization of patents, and international relationship, which links those activities to global patent regimes.

The indicators proposed Ryu and Han (2012) was employed by the researcher to evaluate the performance of higher education institutions in terms of its technology protection performance. Ryu and Han considers patenting as the major drivers for enhancing national competitiveness and most of the advanced countries have been more actively enforcing patent protection.

On the other hand, Sampat, et. Al (2002) re-examined the changes in university patent quality after the Bayh-Dole Act. The Bayh-Dole Act, passed in 1980, is widely recognized as a major change in federal policy towards academic research. Bayh-Dole allowed universities to retain the rights to patents resulting from government funded academic research and encourage university entry into

patenting and licensing. There has been much discussion of the positive and negative impacts of Bayh-Dole on the academy and on technology transfer, but relatively little empirical The result of the study suggests that there has been no decline in the "quality" if quality is measured by the total number of citations to patents. However, the author concluded the U.S. university research and technology transfer cannot be answered solely with patent citation data.

Meagher and Copeland (2006) presents patent issues facing universities. One of the serious challenge faced by university research administrators is establishing an environment where faculty publications flourish while also ensuring that the university's intellectual property rights are properly maintained. The authors provided guidance on how to facilitate both of these fundamental goals in the context of four key issues affecting university patent interests which are: the risks publications can pose to patent rights; the impact of CREATE Act on collaborative endeavors; special considerations for patents resulting from government-sponsored research; and the importance of laboratory notebooks in documenting the date of an invention. On publication issue, according to the authors, the safest course is to be proactive. One should file a sufficiently descriptive patent application before publicly disclosing the invention, whether the disclosure occurs via a periodical, an industry conference, an internet abstract, or even posting research results on a poster board outside the office. Filing a patent application before disclosure establishes a priority filing date and protects the researcher's idea.

Conversely, the Cooperative Research and Technology Enhancement Act was enacted in March 2004 in an effort to promote collaborative research among universities and industries. However, a gap in the law proved problematic by discouraging collaborative efforts among different universities and corporations based on the tangible fear of triggering an obviousness rejection. Hence, the authors suggested that a university research administrators' needs to be careful in defining the scope of the subject matter covered by a joint research agreement. They should carefully consider all possible subject matter when defining the scope of work covered under a proposed joint research agreement, to prevent falling outside the auspices of the CREATE Act's protection against a possible obviousness rejection.

Finally, Meagher and Copeland (2006) concluded that for a research administrators and other technology transfer professionals, the challenge of meeting a plethora of different interests while still adhering to the intricacies of the law is certainly not an easy one. Careful planning, constant communication, and the implementation of a detailed protocol that governs proper procedures from the very beginning stages of research to the very end of an issued patent's term is very important.

All the above-cited literatures provided insights on the importance and benefits of protecting ones intellectual property. It provided essential bases in the formulation of the present study.

Related Studies

The present study deals with the technology protection and performance of higher education institutions in licensing in the Philippines. Along this line, many studies have been conducted to establish the importance and roles of technology protection in universities or higher education institutions.

Patents are important indicators of research activities. Hence, a study on research productivity was conducted by Baciles (2014). The study aims to determine how the research culture and teacher education institutions profile affect the research productivity of selected SUCs teacher education institutions in Region III from 2001-2005 along with the institutions research 1) priorities and relevance, 2) funding and other sources, 3) implementation, monitoring, evaluation and utilization of research outputs and 4) publication and dissemination. The investigation considered technological SUCs in Region III including : Bataan Polytechnic State University in Balanga City, Bulacan State University in Malolos City, Don Honorio Ventura College of Arts and Trade in Bacoor, Pampanga, Nueva Ecija University of Science and Technology in Cabanatuan City, Nueva Ecija, Ramon Magsaysay Technological University in Zambales and Tarlac State University in Tarlac.

The results of the study revealed that the research culture and the faculty researcher's profile significantly affect the SUCs research productivity along gender, years of teaching experience, workload, faculty rank, common criteria

evaluation (CCE) financial support and other incentives, and technical support. Moreover, the selected SUCs have significant influence on the effects of research culture and the profiles of faculty researchers on research productivity along LET performance, number of students and faculty members, technical support and accreditation status. It was recommended that selection personnel must devise a clear-cut policy that will include gender and teaching experience in the recruitment of faculty to ensure that research functions of a faculty will not be neglected. Research policies must be enhanced to provide more incentives, faculty-friendly load reduction scheme and attractive remuneration so that research activities will become part of everyday concerns of everyone in the SUCs.

The study of Baciles (2014) is related with the present study inasmuch that it deals with research culture and how it affects research productivity which in turn can affect technology protection performance of a higher education institution. They differ in the scope of the study which is only part of the study at hand.

Asuncion (2006) on the other hand evaluated the present research priorities and capabilities among technological state universities in Region III in terms of selected variables namely: research personnel, facilities and equipment, budgetary allocation, incentives and privileges, number of faculty engaged in research, linkages, number and types of research conducted, quality of research outputs and income generated from research-related outputs and activities. The

descriptive-evaluative research design utilizing the ad hoc individual review model of evaluation was used in the study. It was revealed in the study that the top three common research and development priorities among technological universities in Region III have bearing on food, information technology and energy. This study is related with the present investigation inasmuch as its deals with research priorities of universities which can give understanding on the characteristics of technologies submitted for protection in the Philippines. It turned out that the top applications of patent and utility model in the Philippines is also concentrated on technologies related to food.

In another study conducted by Capague (2013) entitled "Research Environment and Research Productivity of State Universities and Colleges (SUCs) in Panay Island" aimed to determine the relationship between research environment and research productivity of state colleges and universities in Panay Island for the school years 2010-2012. The respondents of the study were the main campuses of the seven SUCs of Panay. The data for the descriptive-correlational study were obtained from a researcher-made questionnaire, interview schedule and documentary analysis. The study found out that the research environment of SUC's in Panay in terms of research competence was supportive in research skills, not supportive in membership in research organizations and not supportive in research seminars attended. In terms of research support systems, SUCs were supportive in research facilities, not supportive in research budget, and supportive in technical assistance. As to

research priority areas, the SUCs in Panay were supportive. However, SUCs were nor supportive in terms of dissemination strategies either in publication type, publication level and publication schedule. Combining the values of all these components of research environment, SUCs in Panay had a less supportive research environment.

On the other hand, the research productivity of SUCs in Panay is characterized as follows: In terms of the number of researches conducted, the SUCs were productive; as to number of researches published, they were productive; while as to the number of faculty who served as research referees/reviewers, Panay SUCs were not productive and regarding to the number of faculty who served as lecturer/resource speaker in research seminar/conference, SUCs were less productive. Thus, when all indicators of research productivity were combined, the SUCs were less productive. Furthermore, a significant relationship existed between research environment and research productivity of SUCs in Panay. This study is related with the present study since both deals with state universities and colleges but they differ in scope.

A study by Mendoza (2006) entitled "Human Resource Management Practices and Their Effects to Faculty Performance in Selected Private Tertiary Educational Institutions in the Philippines" explored the prevailing human resource management practices and their effects to faculty performance. This study used a sample size of 100 faculty members that were selected at random

from the different institutions. Respondents are 25 years old and above, single or married, has been in the service for no less than one (1) year, full-time or part-time status. A sample size of 100 students was selected at random from the different institutions. The respondents are faculty members and students from selected private tertiary educational institutions in Metro Manila. It used the Human Resource Management Practices Questionnaire (HRMPQ). This is a validated instrument which seeks to measure the human resource management practices implemented by the human resource department of the institutions in terms of the following factors: job organization and information, acquisition of human resources, maintenance, faculty development, and research.

The results of the study revealed that among the components, maintaining a complete records system of all human resource of the entire institutions proves to be the most important practice in human resource management while conducting human resource planning was considered as the least practice satisfactorily performed. Also, finding implies that those faculty members who experienced and received good compensation packages and other benefits are more effective in teaching compared to those who did not receive such. Hence, Mendoza (2006) concluded that the human resource management practices in selected private tertiary educational institutions in Metro Manila are performing satisfactorily based on the assessment done by the faculty.

The study of Mendoza (2006) is related with the present study inasmuch as the study deals with the performance of a private tertiary educational

institutions in terms of management. However, the study of Mendoza (2006) deals with the performance on human resource management.

Consequently, Odi (2014) conducted a study to determine the science laboratory management practices in state universities and colleges in CALABARZON. The study provided information on the profile of state universities and colleges in CALABARZON in terms of SUC level, accreditation status, number of campuses, laboratory fee per subject, number of student per laboratory class and number of teaching loads. The status of science laboratory management practices of different state universities and colleges in CALABARZON with respect to budget allocation, inventory of apparatus and equipment, policies and guidelines, maintenance and services and waste management practices with respect to the aforementioned variables when grouped according to school and the significant relationship between the profile variables and the status were found out.

The study yielded the following data: of the SUC's only one (1) is classified as SUC Level IV, majority of the programs offered are qualified for Level I and Level II status, majority has ten (10) campuses, majority are classified as Center of Development for Agriculture, SUC A has the highest laboratory fee, all SUCs have 25-50 number of students per laboratory class and most of the SUC's have 21 units of teaching load. Based on the findings, it was concluded that the science laboratory management practices in state universities and colleges in CALABARZON varies independently. It was also found out that the

higher the budget allocation in the science laboratories, the more are the accredited programs in state universities and colleges.

A study entitled "Strategic Business Administration Program Model for Private Higher Education Institutions in the Capital Region, Philippine towards ASEAN Integration" by Lacaden (2014) explored the assessments of selected private higher education institutions' administration and faculty, on the different ASEAN Integration determinants and comparative advantages variables for the business administration program. The ASEAN Integration determinants were based on the CHED strategic plan for 2011-2016, while the comparative advantage were the basic competency standards stated in CMO 36, series of 2006 and CMO 06, series of 2012. Findings of the study revealed that 29 ASEAN Integration determinants significantly affect the competitiveness and professional confidence. Hence, the private educational institutions must focus on their program towards internationalization.

A study conducted by Manzano (2015) determined the level of preparedness of State Universities and Colleges (SUCs) in Ilocos Sur for amalgamation during the academic year (2014-2015). The study focused on the profile of the SUCs, organizational culture and preparedness for amalgamation. The respondents of the study were the University of Northern Philippines (UNP), Ilocos Sur Polytechnic State College (ISPSC) and North Luzon Philippines State College (NLPSC). The results showed that the strengths of SUCs in Ilocos Sur are on the higher education services while its weakness are

along research and extension services. SUCs in Ilocos Sur were prepared for amalgamation in terms of awareness and acceptability, benefits, drawbacks administrative capability, resources and support. Hence, Manzano (2015) recommended that administrators of SUCs in Ilocos Sur should strengthen its research and extension to conduct more quality researches and extension services.

On the bigger perspective, Olvido (2015) studied the fractal dimensions of university ranking in Asia and the world. It sought to describe the roughness of the criteria used to identify the universities in the world and in Asia based on the recent 2013 Times Higher Education Quality Survey (THEQS). This survey was conducted by Thomson Reuter, the most authoritative body by far which emphasizes teaching, research and citations. The findings of the study revealed that top 100ranking manifest a mono-fractal dimension. Teaching and research-citation influence, on the other hand, showed mono-fractal dimension in both the top ranked universities in the world and in Asia. Hence, the researcher concluded that teaching and research in both groups are excellent in the top ranked universities. In terms of citation, ruggedness or multi-fractal dimension are more evident in the top universities in the world while in Asia, the top universities are mono-fractal or less rugged. It is highly recommended that universities should produce high quality and globally competitive graduates and emphasis should be placed in providing quality researches, premium in research volume and citations.

With the increase of awareness and focus on university research commercialization, much research had been conducted to investigate this subject. In a study by Winder (2012) entitled " Productive commercialization of university technology", conducted a quantitative analysis to determine if greater university research expenditures and more university office of technology commercialization (OTC) would result to greater license income. Data collected were taken from the Statistics Access for Tech Transfer (STATT) database maintained by the Association of University/Technology Managers (AUTM). The sample size consisted of 203 universities during the ten-year period with a minimum of 79 universities reporting for each of the ten years, 2001 through 2010. Universities in STATT comprise approximately 85% of the total annual university research expenditures in the United States. The research concluded that significant correlation between higher levels of university research expenditures and higher licensing income, and significant correlation between higher staffing levels in the university OTC and higher licensing income. In addition, the existence of significant differences among selected university sub-groups was identified in the productive commercialization of university technology. This study is similar with the present study inasmuch that both deals with commercialization of technologies derived from universities.

Another study on commercialization conducted by Zhou (2015) investigated the many obstacles existed in the path of university research commercialization. His study also aimed in providing a framework that could be

used by most universities to access and improve their research commercialization process. A survey that covered a sample size of 1110 researchers at the targeted university was conducted to investigate the importance of different resources at different stages of the process.

Resources that were under investigation were grouped into four categories: technical, human, social, and financial resources. To assess organizational characteristics of the targeted university, interviews were conducted with 22 faculty, three representatives from the administration, one representative from the intellectual property office, and one representative from an external organization. Six criteria derived from previous research were used to guide the assessment: (1) expenditures on research and development (R&D), (2) intellectual property policy, (3) research field, (4) key individuals, (5) commitment to innovation, and (6) networking with external relations.

Results of the study showed that the most important resources for research commercialization were industrial connections (social resource) and assistance from the intellectual property (IP) office (human resource), with industrial connections playing a more importance role at the beginning of the process and the IP office from the stage of patent application. Moreover, it was found that the targeted university had strong evidence of the advantages of expenditures on R&D and research field, however, it was relatively weak in the other four characteristics. The study of Wilder and Zhou are similar with the

present study inasmuch that both deals with commercialization of technologies derived from universities.

Mattsson (2011) conducted a study on the European knowledge transfer reflected by research collaboration and patent citation indicators. According to her knowledge transfer consists of activities that aim to capture and transmit knowledge, skills and competence from those who generate them to those who will transform them into socio-economic outcomes. In the context of the March 2000 Lisbon strategy and its aim to make the European Union the "world's most dynamic and competitive knowledge economy", knowledge transfer is considered to play an important role in helping to overcome obstacles such as a weak environment to stimulate high quality research and exploit research results.

The introduction of new funding schemes and policies aimed at increasing knowledge flow between countries and sectors in Europe has increased the demand for studies of the impact of such policies and funding mechanisms and the development of relevant and accurate indicators related to them. The aim of this thesis was to study the dynamics of knowledge transfer in Europe and to examine how knowledge transfer can be measured and analyzed through different indicators. This was done by studying co-authorships and collaborations within Europe as indicators of geographical knowledge transfer and patent citations as an indicator of sectoral knowledge flow.

The results of the study showed that researchers from smaller countries co-authored more with other EU countries than those from bigger countries, while the co-authorship rate with extra-EU partners was not dependent on a country's size. Co-authorship patterns were also found to depend on the scientific field. The analysis also indicated that multilateral collaborations funded through the EU Framework Programmes are more exclusively European in nature. In contrast, co-publication patterns in multilateral collaborations suggested that European researchers tend to co-author more with global, rather than exclusively European partners and that this global multilateral orientation in co-publications continues to rise. When using co-publications as an indicator for geographical knowledge flow, the results demonstrated that European research policy most likely has had an impact on research collaboration patterns. However, the results also strongly suggested that any direct impact was limited and did not over-ride self-selected collaboration patterns that continue to drive a more global, rather than exclusively European, research collaboration orientation.

Mattsson (2011) also found out that a more disaggregated scrutiny of publication patterns also underscored very clearly that collaboration strategies show considerable diversity across scientific fields, as well as countries. Further, the results suggest that some policies, to support innovation in regions with a low absorptive capacity (weak innovation activities and a low tech profile) e.g. supporting regional R&D through subsidies, may be less successful than the

incorporation of qualified personnel at firms or the increase of local university industry links.

The role of universities has evolved over the centuries. The most recent manifestation is the 'Entrepreneurial University' which engages with industry through various knowledge transfer practices and seeks to commercialize its research (Ismail, 2007). The primary aim of Ismail (2007) paper is to explain why some patents are exploited while others are not. This, in turn, involves exploring the actors who are involved in the decision to patent a scientific discovery and take it forward to exploitation. By identifying the factors that promote and hinder patent exploitation this will assist Technology Transfer Offices in deciding which inventions to patent. His study used qualitative methods incorporating a case study approach.

The patent portfolio from the University of Strathclyde was used as the case study. Interviews with six directors of technology transfer offices in universities in Scotland and England were undertaken to understand the general process of commercialization. Two samples of patents from the University of Strathclyde's patent portfolio, one comprising patents that were commercially exploited, and the other comprising unexploited patents, were examined in order to understand the different outcomes. Exploited patents included both those that were licensed to establish and those that were used to start new spin-off companies.

The study of Ismail (2007) found out that whether a patent is commercially exploited, and way in which it is exploited is influenced by three factors: (i) the entrepreneurs and the inventors, their characteristics and motivations. (ii) the characteristics and nature of the technologies (scope, stage) (iii) the TTOs' lack of resources and a due diligence system. The study concluded that with proposals for how TTOs can enhance their decision-making process regarding which discoveries to patent in order to improve the overall effectiveness of the commercialization process in universities.

Consequently, Hoye (2006) investigates the relationship between those incentives for faculty support of university-industry technology transfer that are governed by university intellectual property policies and technology transfer outcomes at Canadian universities. Further the study seeks to explain cross-institutional patterns in the numbers of patents held by Canadian universities using variables that represent the financial incentives and control offered to faculty inventors by the universities' policies. It also investigated the impact of a policy change at the University of Toronto, using interrupted time series analysis techniques and the experiences of faculty inventors at the University of Waterloo through in-depth interviews and thematic analysis of the resulting qualitative data.

The results of the study showed that the change from a "university -owns" to an "inventor-owns" policy appeared to have significantly and substantially increased the number of invention disclosures submitted to the University of

Toronto by its faculty members. The study also suggests that faculty members interpret the incentives governed by intellectual property policies and that this interpretation is shaped by group norms, academic leadership , university culture and the inventors' experiences with technology transfer support organizations. Therefore, the study indicate that university intellectual property policies are effective levers with which to stimulate university-industry technology transfer and thus deserve further study. The importance of university.

All the preceding related studies has provided greater understanding on the topic at hand. It provided essential foundation in the formulation of the present study.

Chapter 3

METHODOLOGY

This chapter presents in details the methods and procedures that were used to determine the performance of technology protection of higher education institutions in the Philippines. It presents the research design, instrumentation, validation of instrument, sampling procedure and statistical tools that was used in the data analysis and interpretation.

Research Design

The research design used in the conduct of the study was the descriptive-correlational research. Descriptive research is most effectively applied to studies aimed at gathering additional information, learning more about an area of interest or becoming familiar with a topic. Both the qualitative and quantitative procedures were used to identify the scope, impact and performance of technology protection of higher education institutions in the Philippines. The qualitative data included interviews while quantitative data came from surveys and Intellectual Property Office of the Philippines (IPOPHL) database. The study included higher education institutions (HEIs) in the Philippines, both public and private that were randomly selected.

Further, this study used the comprehensive patent performance indicators developed and proposed by Tae-Kyu Ryu and Yoo-Jin Han (2011)

in measuring the performance of higher education institutions in the Philippines in terms of technology protection. The study of Fu and Yang elaborated the process whereby patents generate economic outcome and included environment under which a country creates, administers and utilizes patents.

Below shows the summary of the different indicators that were used in measuring the performance of higher education institutions in the Philippines in terms of technology protection and licensing.

Level	Indicator Name	Explanation
Creation Performance	No. of patent and utility model applications	Shows how many patents and utility models are created by HEIs
	No. of technology field according to WIPO classification	Shows the type of technology that dominates an HEI
Administration Performance	No. of patent examinations	Shows how many patents and utility models are administered by an HEI
	No. of PCT international reports	Shows international competitiveness of the l patent examiners
Utilization Performance	No. of patents and utility models that are in force	Shows the patents and utility model that are registered
Licensing Performance	No. of patents and utility models that are in the knowledge-based industries	Shows the patents and utility models that is utilized by an industry through licensing agreement and made available to the public.
Innovation Ecosystem		Shows how encouraging are the conditions in the HEI where inventor/maker can file, register and *maintain* their protected IP

Table 1. Indicators for measuring the technology protection performance of HEIs

Instrumentation

The research instruments that were utilized in this study are the following:

Bibliometric Analysis. Bibliometrics is the field of science that deals with the development of quantitative measures and indicators for sciences and technology, based on bibliographic information (Leeuwen, 2004). Hence, this study will use the following metrics:

Metric 1: Patent/Utility model examinations. The total number of patent/utility models examinations done by the HEIs.

Metric 2: Patent/ Utility Model applications of HEIs. The total number of patent/ utility model documents for each HEIs published over the study period. The researcher used secondary data which are the Intellectual Property Office of the Philippines E-Gazette and its Patent Search platform.

Metric 3: Technology concentration. The distribution of HEIs patent/utility documents in both registered and applied across 35 different technology fields as defined World Intellectual Property Office (WIPO). The WIPO technology classification is a widely accepted technology grouping system for use in patent analytics.

Metric 4: PCT international search reports. The total number of PCT international search reports.

Metric 5: Utilization of patents and utility models. The total number of patent and utility model utilized by industries over the study period.

Document Analysis. This study used document analysis. It is a systematic procedure for reviewing of evaluating documents- both printed and electronic material. Document analysis requires that data be examined and interpreted in order to elicit meaning, gain understanding, and develop empirical knowledge (Corbin and Strauss, 2008; Rapley, 2007). It reviewed and analyzed annual reports, HEIs websites and other internet sources, E-Gazette and patent data of the Intellectual Property Office of the Philippines (IPOPHL) and other databases.

Interview Schedule. The researcher conducted interviews to selected HEIs specifically to research directors, ITSO managers or IPO administrators of the higher education institutions to determine the factors that contribute the performance of higher education institutions HEI in terms of technology protection and further validate the data given in the survey questionnaire.

Google Forms. The researcher gathered data not available in the patent databases using Google Forms. Since, the scope of the study is nationwide, it is sensible to use online surveys to be able to capture the needed information for the study. Google Forms is part of Google Drive for creating surveys, tests, or web input forms. It allows anyone to create an easy to use web form, tie to a spreadsheet where you can track and post it on the web. There was no need to sign in to respond to a form. The respondents can responded to a question by ticking their answers to the available options. Further, the respondents accessed

the form from an email message, Facebook message or from a link to an automatically generated webpage.

Validation of Instrument

The survey questionnaire (Google Form) of the study was validated through expert validation and was administered to researchers in Samar State University to test the validity of the same instrument. The same instrument was subjected for editing by experts in grammar. A test-retest validation was also conducted to qualified respondents outside its samples. All suggestions was incorporated in the survey questionnaire before it is given or distributed to HEI's in the Philippines.

The reliability and validity of the test was also established using Cronbach's coefficient alpha, test-retest and split half reliability methods. The internal consistency Cronbach's alpha has already been established based on the data of field-testing study. Apart from this, test retest reliability coefficients were calculated using following procedure, Test Retest Reliability. The instrument was administered after 2 weeks interval on the sample of 30 respondents at Samar State University. The final questionnaire had Cronbach's alpha of 0.66 and a reliability coefficients of 0.71. These results showed high reliability and validity. Hence, it can be concluded that the instrument is reliable and valid.

After the all the data was gathered from the online survey questionnaire, all responses were further validated through secondary sources such as data

from the Commission on Higher Education (CHED), HEI websites, HEI faculty manuals, and data from the Intellectual Property of the Philippines (IPOPHL). These data include number of permanent faculty, teaching loads, accrediting agencies, status of accreditation and submission of patents and utility models.

Sampling Procedure

At the initial stage of data collection, Slovin's formula was employed in determining the needed samples in the conduct of study in both public and private higher education institution (HEIs) in the Philippines. At present, there are about 228 public HEIs and 1,934 private HEIs (CHED, 2016). A total of 781 respondents wherein 387 respondents from came .from 131 public HEIs and the other 395 respondents from 220 private HEIs in the Philippines that was included in the study. A retrieval rate of 92.3% for public HEI respondents and 70.1% for private HEIs respondents was observed in the conduct of data collection. The retrieval rates of the study can be considered as high considering that the acceptable rate of retrieval for online surveys is 40% (Saldivar, 2012).

Distribution of Respondents. Table 2 shows the profile of respondents in terms of the distribution according to region and type of respondents that were classified into public and private higher education institutions. As shown in the table, there was a total of 781 respondents from 351 public and private HEIs in the country. Majority of the respondents are faculty researchers with 476 (61 percent) of the respondents while the other 305 (39 percent) respondents are

coming from the management personnel of the HEIs. These respondents are distributed from 131 public and 220 private HEIs.

The National Capital Region (NCR) led the country in terms of respondents for both HEI and individual respondents with 69 HEIs (20 percent) having 128 (16.4 percent) individual respondents of the total samples. Caraga Region and MIMAROPA Region on the other hand, tied as the lowest institution respondents with 10 (2.9 percent) out of 351 total HEI respondents while the SOCCSKSARGEN Region got the lowest number of individual respondents with 20 (2.6 percent) of the total respondents. The results imply that the respondents

Table 2. Distribution of Respondents according to region, type of respondents and HEI.

Region	No. of respondents				Public HEI	Private HEI	% HEI
	Public		Private				
	FR	Mgt	FR	Mgt			
NCR	10	13	71	34	10	59	20
CAR	14	11	15	5	6	8	4
I- Ilocos Region	15	12	23	10	11	16	7.6
II- Cagayan Valley	10	2	7	4	5	9	4
III- Central Luzon	16	11	15	12	12	19	8.8
IVA- CALABARZON	19	10	13	5	8	16	6.3
IVB- MIMAROPA	9	7	10	0	6	4	2.9
V- Bicol Region	10	7	16	3	6	9	4.3
VI- Western Visayas	23	29	3	2	13	5	5.2
VII- Central Visayas	13	10	9	16	7	14	6
VIII- Eastern Visayas	32	24	21	6	18	8	7.4
IX- Zamboanga Peninsula	10	8	3	3	6	5	3.2
X- Northern Mindanao	14	9	19	13	7	14	6
XI- Davao Region	4	6	8	11	4	12	4.6
XII- SOCCSKSARGEN	6	6	5	3	3	8	3.2
XIII- Caraga Region	6	2	9	6	4	6	2.9
ARMM	6	3	12	2	5	8	3.6
Total	217	170	259	134			
Grand Total	387		394		131	220	100

are well distributed throughout the country and that the number of respondents reflects the population of HEIs in a specific region.

Table 3 on the other hand, presented the distribution of individual respondents according to type by region. The results showed that the National Capital Region (NCR) had the highest individual respondents of Presidents/VP, Research Directors, Research Staff and Faculty researchers. The regions MIMAROPA and the Caraga Region on the other hand, had the least individual respondents from the management side while Davao Region had the least individual faculty respondents with 11 or 2.3 percent of the total faculty respondents. This was due to the fact that the National Capital Region had the most number of HEIs while the three previously mentioned had the least.

On the utilization of technologies protected, the researcher selected the five (5) HEIs in the Philippines considering its technology protection performance and commercialization. Interviews with the ITSO managers, researcher or HEI's Intellectual Property administrators were conducted to find out the utilization performance and its innovation ecosystem.

Data Gathering Procedure

The following procedures were followed in the collection of data: First, higher education institutions (HEIs) in the Philippines were identified using Slovin's formula. Those HEIs with number of full time faculty below 20 are not included in the study. Second, HEIs patents and utility models were defined. An

Table 3. Distribution of Respondents according to type of respondents by region

Region	President/ Heads/VP Research	Research Director	Research Coordinator/ Staff/SRS	ITSO Manager	ITSO/ IP Staff	Faculty
NCR	8	11	22	3	3	81
CAR	4	5	4	1	2	29
I- Ilocos Region	7	3	12	0	0	38
II- Cagayan Valley	1	2	6	0	0	17
III- Central Luzon	6	8	7	1	1	31
IVA- CALABARZON	0	4	7	2	1	32
IVB- MIMAROPA	2	3	1	1	0	19
V- Bicol Region	3	0	6	1	0	26
VI- Western Visayas	7	9	5	5	5	26
VII- Central Visayas	2	7	8	3	5	22
VIII- Eastern Visayas	3	2	18	4	3	53
IX- Zamboanga Peninsula	2	2	6	0	1	13
X- Northern Mindanao	5	5	8	3	1	33
XI- Davao Region	2	5	2	4	4	12
XII- SOCCSKSARGEN	4	2	3	0	0	11
XIII- Caraga Region	3	0	3	1	0	15
ARMM	3	2	1	0	0	18
TOTAL	62	70	117	29	26	476
Percentage	7.9	9	15	3.8	3.3	61

HEI patent or utility model can only be considered to belong to the HEI if at least one applicant is affiliated in the HEI. Further, only patents and utility models published until December 31, 2015 was included in this study. Thirdly, is the collection and analyzing of data. The researcher personally conducted patent

search and patent analytics of the HEI respondents through IPOPHL database and other database. Moreover, the researcher utilized the social media such as Facebook, HEIs emails, ITSO institutions and other means by sending the link of the online survey questionnaire to gather the necessary data. The same conducted interviews to selected HEIs to further validate and enhanced data gathered from the database. The collected data was tallied, analyzed, validated, presented and summarized.

Statistical Treatment of Data

The following statistical treatment of data were used in the analysis of data.

The frequency count and ranking was used to determine the number of higher education institutions (HEIs) patents and utility models that are applied, registered and utilized. Corresponding statistical values like the weighted mean and percentages were computed for the analysis of data.

The Multiple Regression Analysis and Pearson correlation, on the other hand, were used to understand the relationship between variables. The general purpose of multiple regression (the term was first used by Pearson, 1908) is to learn more about the relationship between several independent or predictor variables and a dependent or criterion variable. The software SPSS Version 24 was utilized in the analysis of data.

Chapter 4

PRESENTATION, ANALYSIS AND INTERPRETATION OF DATA

This chapter comprises the analysis, presentation and interpretation of the findings resulting from this study. The analysis and interpretation of data was carried out in two phases. The first part was based on the results of the online survey questionnaire, deals with a quantitative analysis of data wherein data collected was further validated through secondary sources. The second part of the data collection was an interview to selected higher education institutions (HEI) who are performing in terms of technology protection and commercialization.

Academic Programs with Intellectual Property (IP). Figure 3 shows the profile of HEI respondents in terms of academic programs offered by HEIs in terms of filed IP applications. The results showed that the Engineering programs got the highest IP applications of 57.5 percent followed by the Industrial Technology with 51.8 percent and Agriculture and related fields with 29.8 percent of the programs. The academic programs Accountancy and Business Administration and Criminology got the lowest percentage of 0.9 percent and 0.3 percent respectively. With these results, it is evident that technology related courses tend to produce more technologies for intellectual property protection.

HEI Level/Type. On the HEI Level/Type of higher education institutions

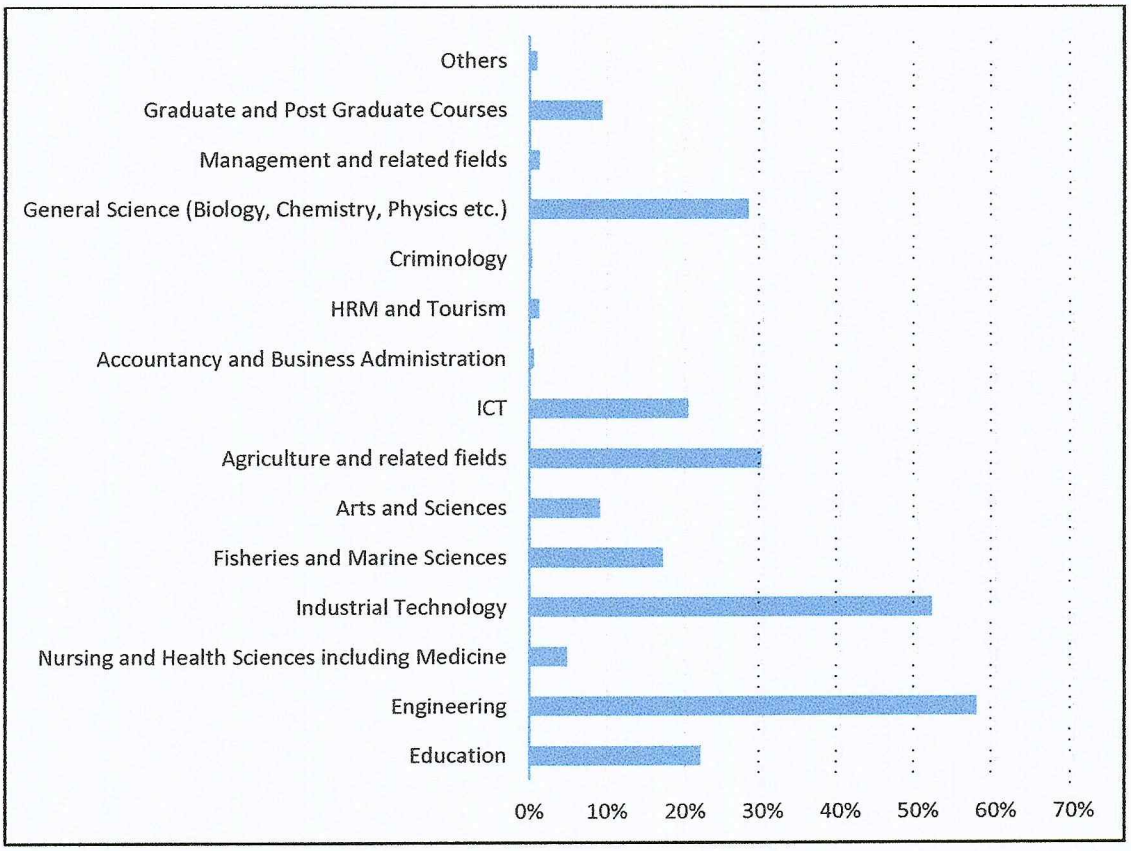

Figure 3. Academic Programs with IP Applications

(HEIs) in the Philippines, Table 4 reveals that that CHED Level III institutions had the highest HEI respondents with 37 (28.2 percent) for public HEIs while regulated institutions had the highest HEI respondents with 149 (68.3 percent) for private HEIs. The results implied that there are more public HEIs that pursues higher HEI Level as compared with the private HEIs. This result is consonant with the data from CHED record as of academic year 2015-2016 since there are only about 253 (11 percent) of the private HEIs including satellite campuses that has accredited programs. In contrast, public HEIs has 297 (44 percent) accredited programs (CHED, 2016).

Table 4. Profile of HEI Respondents in terms of HEI Level/Type by Region

Region	Public HEI					Private HEI		
Level	None	I	II	III	IV	Regulated	Deregulated	Autonomous
NCR	0	3	1	1	5	39	3	18
CAR	0	0	2	3	1	6	0	2
I- Ilocos	0	3	2	2	4	10	2	4
II- Cagayan Valley	0	0	0	2	2	5	0	4
III- Central Luzon	0	5	3	4	0	13	1	5
IVA- CALABARZON	0	1	2	2	3	10	1	4
IVB- MIMAROPA	0	1	3	2	0	4	0	0
V- Bicol	1	0	1	3	1	8	0	1
VI- Western Visayas	0	1	8	3	1	4	0	1
VII- Central Visayas	1	0	2	2	2	1	2	11
VIII- Eastern Visayas	5	5	2	5	1	8	0	0
IX- Zamboanga Peninsula	0	3	3	0	0	4	0	1
X- Northern Mindanao	0	2	1	1	3	10	1	3
XI- Davao	0	0	1	1	2	8	0	4
XII- SOCCSKSARGEN	0	0	0	3	1	6	1	1
XIII- Caraga	0	0	3	1	0	6	0	0
ARMM	0	4	0	1	1	8	0	0
Total	3	28	36	37	27	150	11	59
Percentage	2.3	21.4	27.4	28.2	20.6	68.3	5.1	26.6

Accrediting Agencies. Figure 4 shows the distribution of accrediting agencies of both public and private HEI respondents. The Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACCUP) was the accrediting agency of all public HEIs that composed of 38 percent of the accrediting agencies of respondents. On the other hand, the Philippine Association of Colleges and Universities Commission on Accreditation (PACU-COA) was the accrediting agency of 17 percent of the private HEI respondents followed by the Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU) at 16 percent.

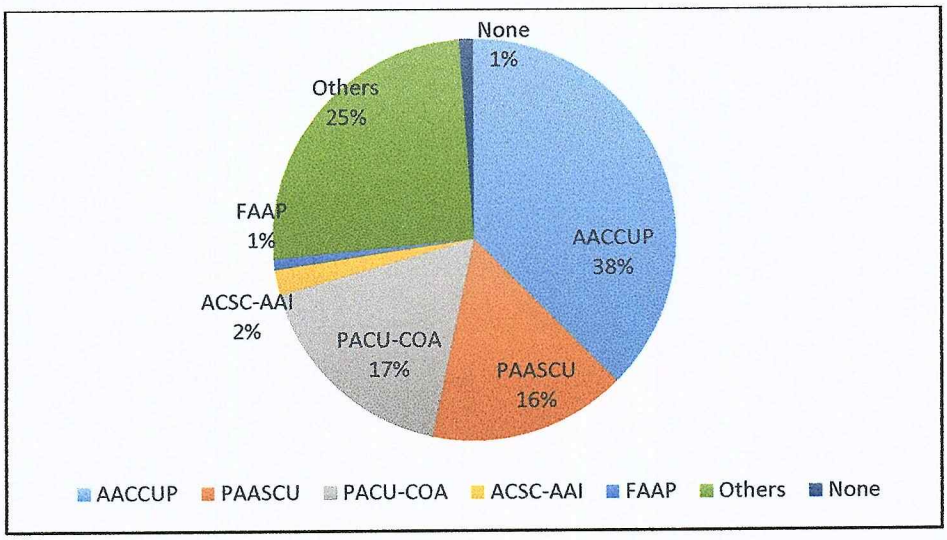

Figure 4. Accrediting Agency of HEI Respondents

Number of Full Time Faculty. The profile of HEI respondents in terms of number of full time faculty is shown in Figure 5. As reflected in the graph, private HEIs had the most number of faculty that are below 50 with 68 or 31 percent of the total private HEI respondents. This was followed by the range between 200-299 number of full time faculty with 32 or 15 percent of the total private HEI respondents. On the other hand, public HEIs had the most number of full time faculty that are between 200-299 with 20 or 15 percent of the total public HEI respondents. This was followed by the range between 300-399 with 17 or 13 percent of the total public HEI respondents.

Maximum Teaching Load of Full Time Faculty. Figure 6 shows the profile of respondents in terms of the maximum teaching load of full time faculty. As shown in the graph, most (41 percent) of the private HEI

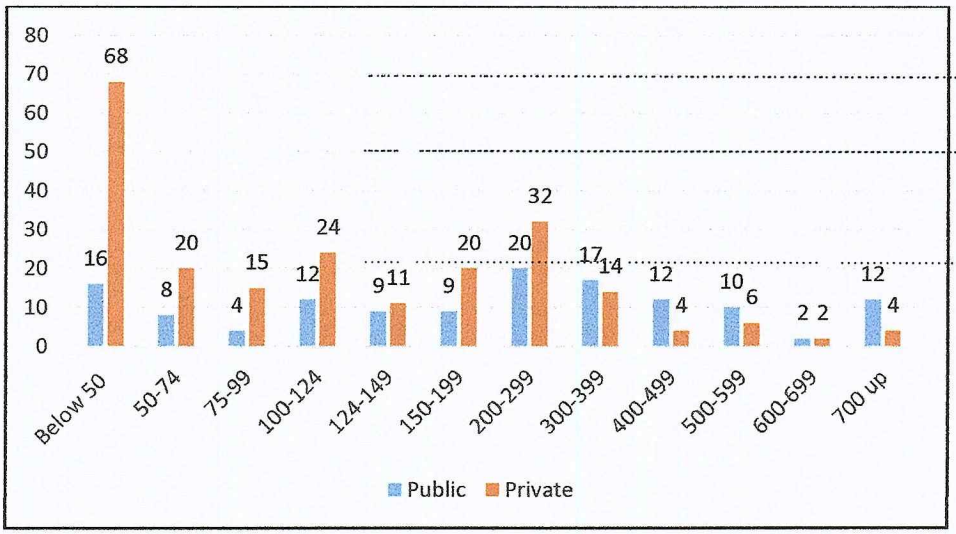

Figure 5. Profile of HEI Respondents in terms of Number of Full Time Faculty

respondents has a teaching load of 24 hours per week followed by 21 hours per week with 33 percent of the private HEI respondents. Conversely, most (40 percent) of the public HEI respondents has a teaching load of 21 hours per week followed by 24 hours per week at 30 percent of the public HEI respondents.

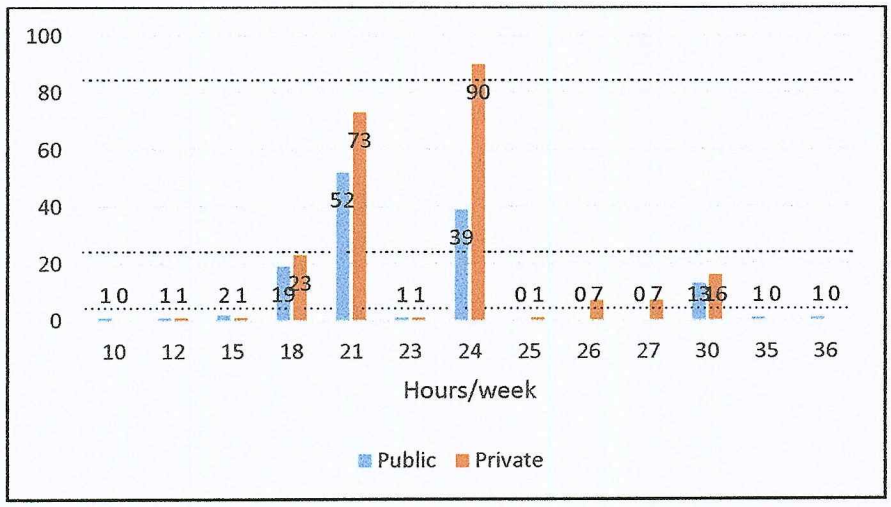

Figure 6. Profile of HEI Respondents in terms of Maximum Teaching Load of Full Time Faculty

the graph, majority or 113 (51 percent) of private HEIs have less than Five hundred thousand (in pesos) R&D Budget followed by Between 1.1 Million-3 Million (in pesos) with 48 (22 percent) of the private HEI respondents with a difference of 29 percent. For public HEIs, the range Between 1.1 Million-3 Million got the highest response with 23 percent of the public HEIs followed by the range Between 3.1 Million-6 Million with 27 (21 percent). Four of the public HEI respondents marked that their current R&D Budget is between 50.1 Million and Up. These public HEIs include University of the Philippines (UP), Mindanao State University (MSU), Don Mariano Marcos Memorial State University (DMMMSU) and University of Southern Mindanao (USM). On the other hand, only one private HEI responded to this range, that is, De La Salle University-Manila (DLSU-Manila).

IP Budget. Figure 8 presents the profile of HEI respondents in terms of IP Budget. As shown in the graph, majority or 169 (77 percent) of the private HEIs does not have budget allocation for their Intellectual Property (IP) protection. Meanwhile, 47 (36 percent) of the public HEI respondents responded that they do not have allocation for IP protection. Moreover, three of ITSO Managers indicated that their institution has not yet allocated budget for IP, they are: Aklan

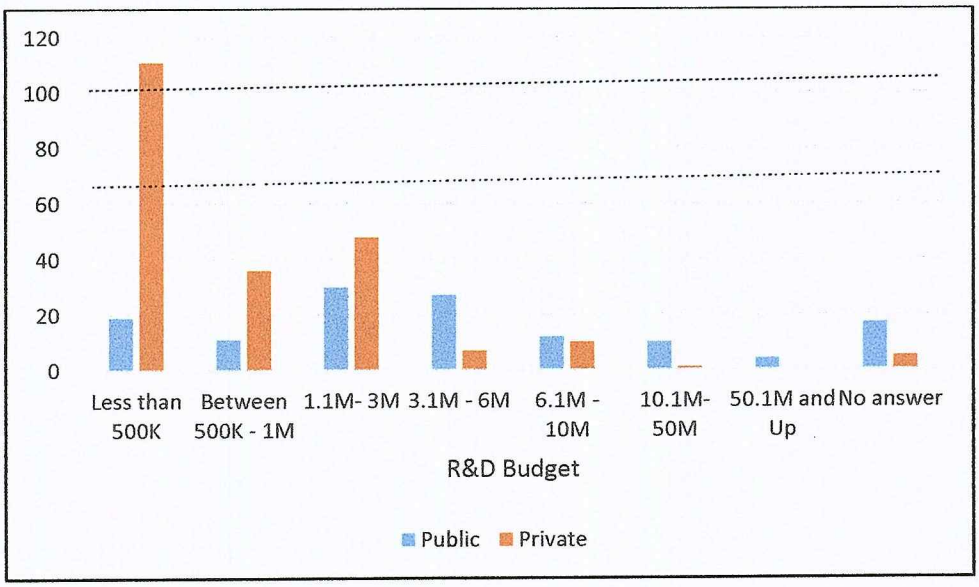

Figure 7. Profile of HEI Respondents in terms of current R&D Budget

State University (ASU), Mindanao University of Science and Technology (MUST) and University of San Jose Recolitos (USJR). On the other hand, 37 (28 percent) and 30 (14 percent) of public and private HEIs posted that their budget allocation for IP is below five hundred thousand, respectively. Only one HEI posted a budget allocation of between 3.1 Million-6 Million and between 2.1 Million-3 Million, they are: Adamson University (AU) and De La Salle University-Manila, respectively.

Existence of IP Policy. The institution's IP Policy governs the ownership and disposition of intellectual property which includes inventions including utility models, copyrights, trademarks and tangible research property. The profile of HEI respondents in terms of existence of IP Policy is reported in Figure 9. Majority or 222 (63 percent) of the HEI respondents does not have an IP Policy. Of these, 52 percent (182) are coming from the private HEIs.

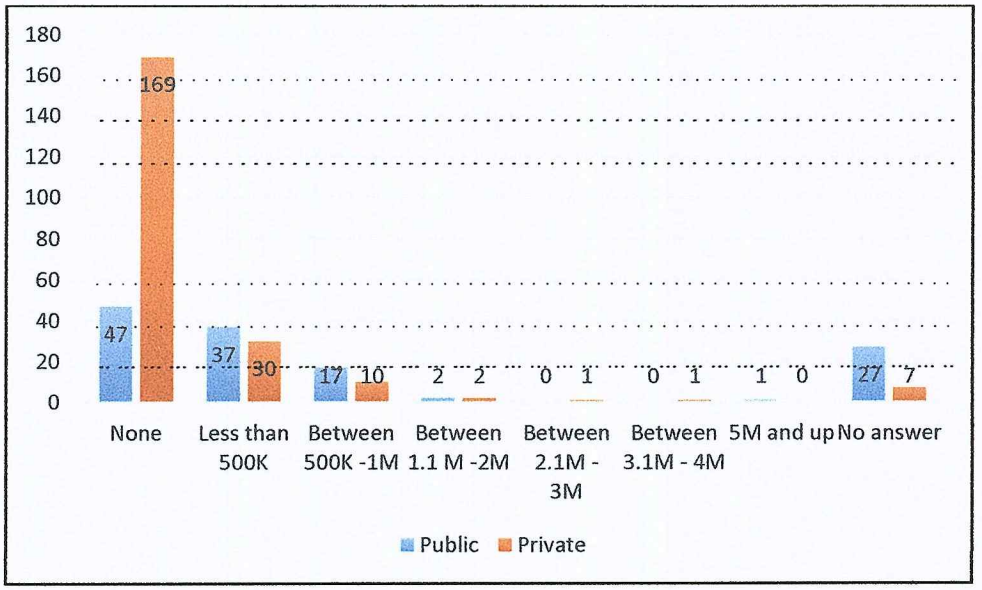

Figure 8. Profile of HEI Respondents in terms of current IP Budget

Conversely, 91(26 percent) public HEI respondents has an IP Policy while 40 (11 percent) private HEIs has an IP Policy.

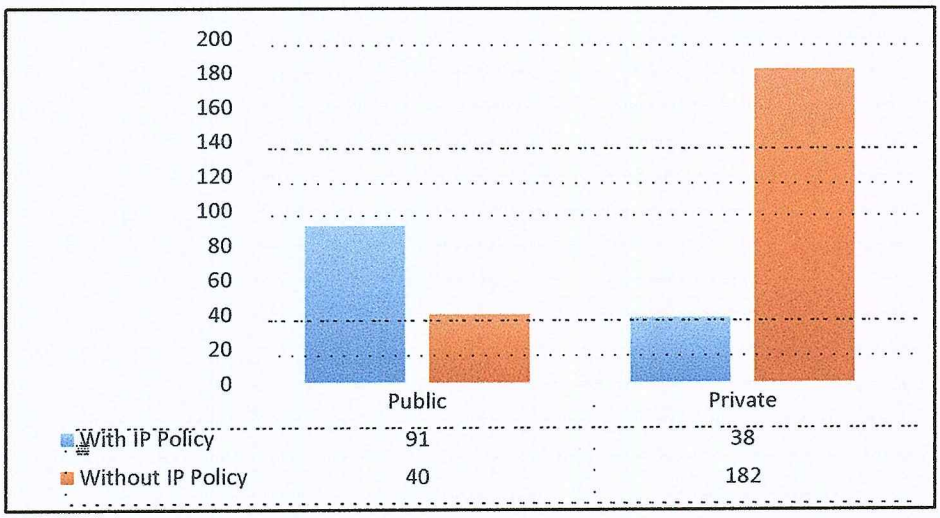

Figure 9. Profile of HEI Respondents in terms of existence of IP Policy

ITSO Franchise. Figure 10 presents the profile of HEI in terms of franchisee of the Innovation Technology Support Office (ITSO). ITSO is a

network of innovation support offices or patent libraries established in 2012 by the Intellectual Property Office of the Philippines (IPOPHL) to strengthen institutional capacity to access patent information and make use of the patent system. As reflected in the graph, majority or 283 (81 percent) of both public and private HEI respondents are not a franchise of the ITSO while the other 68 (19 percent) of the HEI respondents are ITSO institutions. Further, public HEIs respondents had greater number of franchise of ITSO by 30 percent.

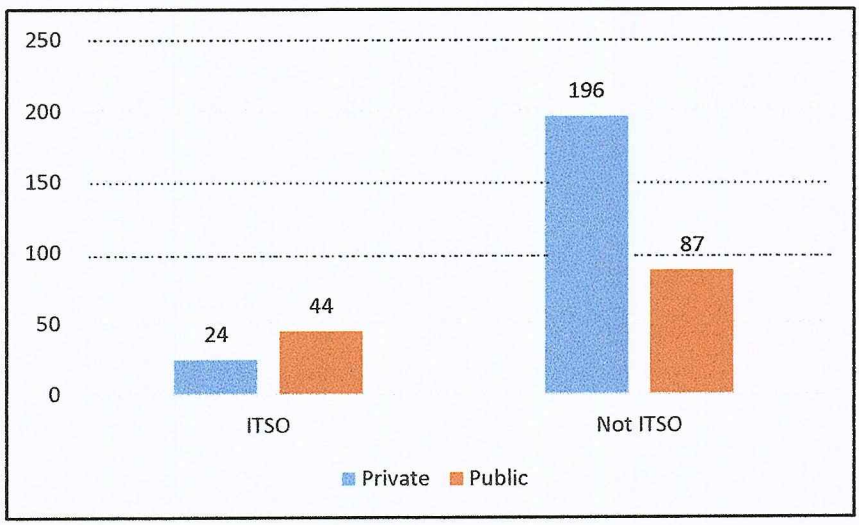

Figure 10. Profile of HEI Respondents in terms of Franchisee of the Innovation Technology Support Office (ITSO)

Creation Performance of HEI Respondents

Number of IP Applications. Table 5 presents the creation performance of HEI respondents in terms of its capacity to create or produce technology measured by the total number of IP applications submitted to IPOPHL since the institution started to file. As shown in the table, Public Level IV institutions

composed the bulk of IP applications with 362 (45 percent) of the total IP applications filed from 17 institutions. This was followed by public Level III institutions with 237 (29 percent) of the total IP applications filed by 22 institutions. On the other hand, only 72 (8 percent) of the total applications came from private HEIs. A bulk of the applications are coming from the regulated private institutions which constitutes 50 (69 percent) of the total private HEI respondents. Both autonomous and deregulated private institutions had 11 (15 percent) IP applications.

Table 5. Distribution of HEIs in terms of Number of IP Creation

PUBLIC					PRIVATE				
	No. of HEIs	HEI with IP Application	%	Total App		No. of HEIs	HEI with IP Application	%	Total App
NA	3	0	0	0	Regulated	150	2	1.4	50
Level I	28	4	14	27	Deregulated	11	3	27	11
Level II	36	16	44	182	Autonomous	59	11	19	11
Level III	37	22	59	237					
Level IV	27	17	63	362					
Total	131	59	45	808		220	16	7.33	72

Technology Fields according to WIPO Classification. Figure 11 presents the distribution of technology fields according to WIPO classification of the technologies filed by the 351 HEI respondents. This data was based on the published patent and utility model filed by the HEI at the IPOPHL. As reflected in the graph, majority or 231 (49 percent) of technologies submitted by HEI respondents to IPOPHL are related to food technology. This was followed by

pharmaceuticals and organic chemistry products, both at 6 percent. Other technologies applied by the Philippine HEIs include electrical machineries/apparatus, machine tools, IT methods for management, computer technology, telecommunications and other consumer goods.

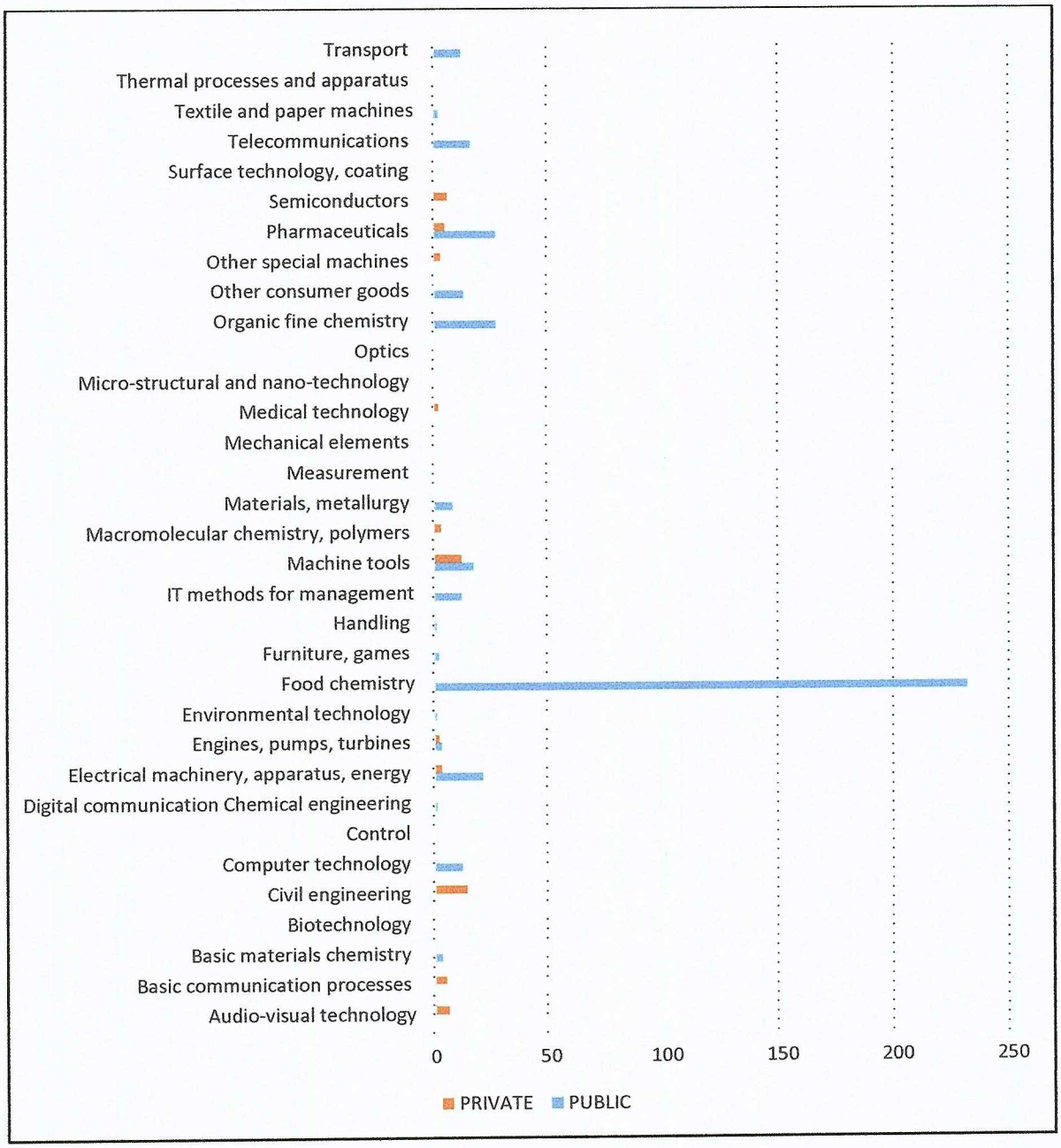

Figure 11. Distribution of HEIs' technology fields according to WIPO Classification

Administrative Performance of HEI Respondents

Number of IP Examinations. Table 6 presents the administrative performance of HEI in terms of IP Examination according to HEI Level. As shown in the table, among the 351 HEI respondents, only 76 (21.7 percent) are doing patent and utility examinations or administered by an HEI. Of these, 58 (16.5 percent) are public HEIs with a total of 897 (91 percent) IP examinations and the other 18 (5.1 percent) are private HEIS with 84 (9 percent) of the IP examinations. Public Level IV HEI had the most number of with 366 (40.8 percent) IP examinations followed by public Level III HEI with 340 (34.7 percent) IP examinations. On the hand, Autonomous HEI had the most number of IP examinations among private HEIs with 65 (77.3 percent) of the total private IP examinations.

Table 6. Distribution of HEIs in terms number of IP examinations

PUBLIC						PRIVATE					
	No. of HEIs	With IP Exam	%	Total Exam	%		No. of HEIs	With IP Exam	%	Total Exam	%
NA	3	0	0	0	0	Regulated	150	3	2	15	18
Level I	28	5	18	22	2.5	Deregulated	11	1	9	4	4.8
Level II	36	15	42	169	18.8	Autonomous	59	13	22	65	77.3
Level III	37	21	57	340	37.9						
Level IV	27	17	63	366	40.8						
Total	131	58	44	897	100		220	18	7.9	84	100

Number of PCT Reports. The HEIs' administration performance in terms of number of PCT reports is presented in Table 7. The Patent Cooperation Treaty (PCT) is an international patent law treaty, concluded in 1970 that provides a unified procedure for filing patent applications to protect inventions in each of its contracting states. A patent application filed under the PCT is called an international application, or PCT application. As reflected in the table, only 4 (1.1 percent) of HEIs made it in the international arena by filing an international patent application. They are: University of the Philippines-Manila, University of the Philippines-Diliman, Adamson University and De La Salle University.

Table 7. Distribution of HEIs in terms number of PCT reports

PUBLIC						PRIVATE					
	No. of HEIs	With PCT Report	%	Total App	%		No. of HEIs	With PCT Report	%	Total App	%
NA	3	0	0	0	0	Regulated	150	0	0	0	0
Level I	28	0	0	0	0	Deregulated	11	0	0	0	0
Level II	36	0	0	0		Autonomous	59	2	1.4	7	34
Level III	37	0	0	0	0						
Level IV	27	2	0.6	14	66						
Total	131	2	0.6	14	66		220	2	1.4	7	34

Utilization Performance of HEI Respondents

The utilization performance of HEIs in terms of number of registered patent and utility models is presented in Table 8. As shown in the table, 36 (10.3 percent) of the HEI respondents have registered patents and/or utility models.

Of these, 448 (98 percent) are from public HEIs while the other 6 (2%) are from private HEIs.

Licensing Performance of HEI Respondents

Only three (3) HEIs was able to do licensing and commercialization of their protected IP. They are: University of the Philippines-Diliman with their Titanium Nitride coating , University of the Philippines-Diliman with their Lagundi formulation licensed with Pascual Laboratories and University of San Carlos with their biochemical processing of bio-organic wastes from processed mango.

Table 8. Distribution of HEIs in terms number of registered IP and IP in Industry

PUBLIC									
	No. of HEIs	With Registered IP	Total Registered IP	HEI w/ IP in Industry		No. of HEIs	With Reg IP	Total Reg IP	HEI w/ IP in Industry
NA	3	0	0	0	Regulated	150	0	0	0
Level I	28	2	10	0	Deregulated	11	0	0	0
Level II	36	8	102	0	Autonomous	59	3	6	1
Level III	37	11	141	0					
Level IV	27	12	195	2					
Total	131	33	448	2		220	3	6	1

Innovation Ecosystem of HEI Respondents

The innovation ecosystem according to public HEIs is presented in Table 9. The researcher used a Likert-type survey to collect quantitative date from 387 respondents from both the management and faculty researchers. The survey assessed the respondents' perception on the state of environment in their

own institution with regards to innovation. Based from the results, most of the respondents agreed to the statement "My institution have a fully aligned strategic innovation agenda" with a mean of 4.08. This was followed by the statement "My institution have a visible senior management (President, VP, Deans, Directors), involvement towards innovation and maximization of its benefits with a mean of 3.66. Conversely, the statement "My institution have a well-defined yet flexible execution process, having a dedicated team who performs and has established a track record(i.e. innovation awards, registered IPs, commercialized technologies, etc.)" got the lowest mean of 2.86.

The innovation ecosystem according to private HEIs is presented in Table 9. The researcher used a Likert-type survey to collect quantitative date from 393 respondents from both the management and faculty researchers. The survey assessed the respondents' perception on the state of environment in their own institution with regards to innovation. Based from the results, the statement "My institution have a fully aligned strategic innovation agenda" got the highest mean of 2.84. This was followed by the statement "My institution have a creative, resourceful, multi-functional and highly dedicated skilled research and IP team" with a mean of 2.79. On the other hand, the statement "Personnel and students in
my institution understand the importance of innovation" got the lowest mean of 2.19.

Table 9. Innovation Ecosystem as rated by Public HEIs

STATEMENTS	1	2	3	4	5	Total	Mean	Interpretation
Personnel and students in my institution understand the importance of innovation.	12	55	93	131	96	387	3.63	SA
My institution have an infrastructure for IP such as an IP Office and personnel for filing, registration and maintenance of IP in the IPOPHL.	10	73	106	128	70	387	3.45	A
My institution have a fully aligned strategic innovation agenda.	49	97	101	98	42	387	4.08	SA
My institution have a visible senior management (President, VP, Deans, Directors) involvement towards innovation and maximization of its benefits.	40	44	54	117	132	387	3.66	A
My institution participates in IP related activities in the international arena such as attendance in international IP forum, conference and trainings.	16	93	91	103	84	387	3.38	N
My institution have a creative, resourceful, multi-functional and highly dedicated skilled research and IP team.	45	65	43	104	130	387	3.54	A
My institution supports filing of PCT (an International Patent System)	37	43	77	117	113	387	3.58	A
My institution supports creation of the mind, facilitates registration and maintenance of IP.	36	66	113	130	72	387	3.58	A
My institution have a well-defined yet flexible execution process, having a dedicated team who performs and has established a track record(i.e. innovation awards, registered IPs, commercialized technologies, etc.).	30	145	106	63	43	387	2.86	N
GRAND MEAN	3.53							A

Legend:

4.51 - 5.00	(SA)	Strongly Agree
3.51 – 4.50	(A)	Agree
2.51 – 3.50	(N)	Neither agree or disagree
1.51 – 2.50	(D)	Disagree
1.00 – 1.50	(SD)	Strongly Disagree

Table 10. Innovation Ecosystem as rated by Private HEIs

STATEMENTS	1	2	3	4	5	Total	Mean	Interpretation
Personnel and students in my institution understand the importance of innovation.	108	163	78	29	15	393	2.19	D
My institution have an infrastructure for IP such as an IP Office and personnel for filing, registration and maintenance of IP in the IPOPHL.	93	134	123	23	19	393	2.33	D
My institution have a fully aligned strategic innovation agenda.	68	90	103	99	33	393	2.84	N
My institution have a visible senior management (President, VP, Deans, Directors) involvement towards innovation and maximization of its benefits.	94	143	87	30	39	393	2.43	D
My institution participates in IP related activities in the international arena such as attendance in international IP forum, conference and trainings.	130	30	123	90	20	393	2.59	N
My institution have a creative, resourceful, multi-functional and highly dedicated skilled research and IP team.	73	96	106	78	40	393	2.79	N
My institution supports filing of PCT (an International Patent System)	132	60	110	71	20	393	2.46	D
My institution supports creation of the mind, facilitates registration and maintenance of IP.	90	149	114	19	21	393	2.32	D
My institution have a well-defined yet flexible execution process, having a dedicated team who performs and has established a track record(i.e. innovation awards, registered IPs, commercialized technologies, etc.).	70	112	113	87	15	393	2.69	N
GRAND MEAN	2.52							N

Legend:

4.51 - 5.00	(SA)	Strongly Agree
3.51 – 4.50	(A)	Agree
2.51 – 3.50	(N)	Neither agree or disagree
1.51 – 2.50	(D)	Disagree
1.00 – 1.50	(SD)	Strongly Disagree

Overall, public HEIs rated their institution as encouraging while private HEIs rated their institution as not encouraging nor discouraging.

Table 11. Overall Rating of HEIs on Innovation Ecosystem

STATEMENT	Overall, how do you rate in institutions' innovation environment?							
Ratings	1	2	3	4	5	Total	Mean	Interpretation
Public HEIs	23	53	87	145	79	387	3.53	E
Private HEIs	16	19	129	46	10	393	2.60	N
GRAND MEAN	3.1							N

Legend:

4.51 - 5.00	(SE)	Strongly Encouraging
3.51 – 4.50	(E)	Encouraging
2.51 – 3.50	(N)	Neither encouraging nor discouraging
1.51 – 2.50	(D)	Discouraging
1.00 – 1.50	(SD)	Strongly Discouraging

Significant relationship between the performance indicators of HEIs and their profile variates

Creation performance of public HEIs and their profile variates

Table 12 shows the correlation between the creation performance of public HEIs and their profile variates. The SPSS Model summary as shown in Table 12 contained the following information: R=.498, R square=.548 and Adjusted R square= .199. Only one of the eight independent variables is statistically significant (>.05) which is the existence of IP Policy (p-value=.003). The result further shows that there is a 99.7 percent chance that a true relationship exist between the existence of IP Policy and HEI creation performance. When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is still the existence of IP Policy

(beta=.290) and is followed by the number of full time faculty (beta=.170). Furthermore, the model predicts that at constant coefficient=-3.260, that the existence of IP Policy will increase the creation performance of a public HEI by 2 patents and/or utility models holding all other independent variables constant as expressed in the following model:

$$\widehat{CP} = 1.629\,(EIP) - 3.260$$

where: $\widehat{CP}$ is the estimated number of patents and/or utility model applied by HEI
EIP is the existence of IP Policy

Table 12. Coefficients for the Creation Performance of Public HEIs and their Profile Variates

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-3.260	1.757		-1.856	.066
Academic Programs	.239	.197	.113	1.213	.227
Status of Accreditation	.310	.239	.126	1.296	.197
Number of full time faculty	.002	.001	.170	1.754	.082
Max Teaching Load 1 (hours/week)	.051	.057	.078	.892	.374
R&D Budget (2015)	-.090	.204	-.050	-.440	.661
IP Budget (2015)	.271	.318	.084	.852	.396
Existence of Intellectual Property Policy	1.629	.540	.290	3.015	.003
Existence of ITSO Franchise	-.157	.591	-.026	-.265	.791

a. Dependent Variable: Creation Performance

Creation performance of private HEIs and their profile variates

Table 13 shows the correlation between the creation performance of private HEIs and their profile variates. The SPSS Model summary as shown in Table 14 contained the following information: R=.444, R square=.697 and Adjusted R square= .362. For private HEIs, three of the nine independent variables are statistically significant (>.05) which are: number of academic programs with IP applications (p-value=.007), maximum teaching load (p-value=.007) and number of full time faculty (p-value=.036). When evaluating the standard beta values or"size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is the number of academic programs with IP applications (beta=.248).

Table 13. Coefficients for the Creation Performance of Private HEIs and their Profile Variates

Model			Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-4.154	1.474		-2.818	.005
No. of Academic Programs w/ IP	1.347	.275	.248	2.713	.007
Status of Accreditation	-.061	.271	-.021	-.225	.822
No. of Full Time Faculty	2.001	.001	.161	2.110	.036
Max. Teaching Load	.747	.055	.180	2.722	.007
R&D Budget	.408	.237	.185	1.721	.087
IP Budget	.059	.409	.014	.143	.886
Existence of IP Policy	2.021	1.570	.303	1.287	.199
Existence of ITSO Franchise	-2.021	1.266	-.348	-1.596	.112
Accrediting Agency	.126	.159	.062	.792	.429

a. Dependent Variable: Creation Performance

Furthermore, the model predicts that an increase of academic programs that has potential for generating IP, number of full time faculty will the number of patents and/or utility model applied by a private HEI by 1.347 and 2.001 respectively holding all other independent variables constant. Moreover, the decrease of maximum teaching load will also increase the creation performance of a private HEI by .747 as expressed in the following model:

$$\widehat{CP} = 1.347\,(AP) + 2.001(FTF) + .747\,(MTL) - 4.154$$

where: $\widehat{CP}$ is the estimated patents and/or utility model applied by HEI
AP is the number of academic programs with IP
FTF is the number of full time faculty
MTL is the maximum teaching load

Administrative performance of public HEIs and their profile variates

Table 14 shows the correlation between the administrative performance of public HEIs and their profile variates. The SPSS Model summary as shown in Table 14 contained the following information: R=.459 R square=.510 and Adjusted R square= .359. The result shows that fifty-one percent of the total variability is explained by the eight profile variates of public HEIs. Moreover, two of the eight

independent variables are statistically significant (>.05): existence of IP Policy (p-value=.019) and number of full time faculty (p-value=.046). The result further shows that there is a 98.1 percent chance that a true relationship exist between the existence of IP Policy and HEIs administrative performance while there is

95.4 percent chance that a true relationship exist between the number of full time faculty and HEIs administrative performance. When evaluating the standard

Table 14. Coefficients for the Administrative Performance of Public HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-16.651	8.584		-1.940	.055
	Academic Programs	.797	.964	.079	.828	.410
	Status of Accreditation	1.672	1.168	.142	1.431	.155
	Number of full time faculty	1.009	.004	.201	2.016	.046
	Max Teaching Load (hours/ week)	.203	.280	.065	.726	.469
	R&D Budget (2015)	-.742	.998	-.087	-.743	.459
	Intellectual Property Budget (2015)	1.590	1.556	.103	1.022	.309
	Existence of Intellectual Property Policy	6.297	2.640	.235	2.385	.019
	Existence of ITSO Franchise	-1.050	2.888	-.036	-.364	.717

a. Dependent Variable: Administrative Performance

beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is still existence of IP Policy (beta=.235) and is followed by the number of full time faculty (beta=.201). Furthermore, the model predicts that at coefficient=-16.651, the existence of IP Policy will increase the number of patent and/or utility model examined or search report conducted by a public HEI by 6 while an increase of the number of full time faculty will also increase the same by 1.009 holding all other independent variables constant as expressed in the following model:

$$\widehat{AP} = 6.297\,(EIP) + 1.009(FTF) - 16.651$$

where: $\widehat{AP}$ is the estimated number of IP examined/search report conducted by HEI
EIP is the existence of IP Policy
FTF is the number of full time faculty

Administrative performance of private HEIs and their profile variates

Table 15 shows the correlation between the administrative performance of private HEIs and their profile variates. The SPSS Model summary as shown in Table 15 contained the following information: R=.509, R square=.659, and Adjusted R square= .657. Sixty-five percent of the variance is explained by the predictors. The R Square in a multiple regression represents explained variance that can be contributed to all the predictors in a progression. Moreover, for private HEIs, three of the nine independent variables are statistically significant (>.05) which are: maximum number of teaching load (p-value=.002), R&D Budget (p- value=.011) and IP Budget (p-value=.038). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is the R&D Budget (beta=.264) and is followed by IP Budget (beta=.201) and maximum teaching load (beta=.201). Furthermore, the model predicts that at coefficient =-3.104, the existence of IP Policy will increase the number of patent and/or utility model examined or search report conducted by a private HEI by .929 while an increase of the IP Budget will also increase the same by 2.510 holding all other independent

variables constant. Moreover, the decrease of maximum teaching load of faculty will increase the administrative performance by 2.105 as expressed in the following model:

$$\widehat{AP} = .929(EIP) + 2.510(IPB) + 2.105\,(MTL) - 16.651$$

where: $\widehat{AP}$ is the estimated number of IP examined/search report conducted by HEI
EIP is the existence of IP Policy
IPB is the IP Budget
MTL is the maximum teaching load of faculty

Table 15. Coefficients for the Administrative Performance of Private HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.104	.882		-3.521	.001
	No. of Academic Programs w/ IP	.318	.165	.170	1.932	.055
	Status of Accreditation	-.037	.162	-.020	-.230	.819
	No. of Full Time Faculty	.000	.000	.043	.585	.559
	Max. Teaching Load	2.105	.033	.201	3.164	.002
	R&D Budget	.362	.142	.264	2.551	.011
	IP Budget	2.510	.245	.201	2.086	.038
	Existence of IP Policy	.929	.939	.079	.350	.727
	Existence of ITSO Franchise	-.359	.757	-.099	-.474	.636
	Accrediting Agency	.141	.095	.111	1.478	.141

a. Dependent Variable: Administrative Performance

Utilization performance of public HEIs and their profile variates

Table 16 shows the correlation between the utilization performance of public HEIs and their profile variates. The SPSS Model summary as shown in Table 16 contained the following information: R=.442, R square=.495 and Adjusted R square= .142. The result shows that almost fifty percent of the total variability is explained by the eight profile variates of public HEIs. Moreover, three of the eight independent variables are statistically significant (>.05). These are existence of IP Policy (p-value=.007), number of full time faculty (p-value=.016) and existence of ITSO Franchise (p-value=.047). The result further shows that there is a 99.3% chance that a true relationship exist between the existence of IP Policy and HEIs utilization performance while there is 98.4 percent chance that a true relationship exist between the number of full time faculty and HEIs utilization performance. On the other hand, there is 95.3 percent chance that that a true relationship exists between the number of full time faculty and HEIs utilization performance.

When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable are in the following order: existence of IP Policy (beta=.276), number of full time faculty (beta=. 245) and existence of ITSO Franchise (beta=-200). Furthermore, the model predicts that at coefficient =-10.782, the existence of IP Policy will increase the number of registered patent and/or utility model by a public HEI by 5.511 while an increase of number of full time faculty will also increase the same by

Table 16. Coefficients for the Utilization Performance between Public HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-10.782	6.472		-1.666	.098
	Academic Programs	.495	.726	.066	.682	.497
	Status of Accreditation	.415	.881	.047	.472	.638
	Number of full time faculty	2.908	.003	.245	2.442	.016
	Max Teaching Load (hours/week)	.254	.211	.109	1.203	.231
	R&D Budget (2015)	-.347	.753	-.055	-.461	.645
	Intellectual Property Budget (2015)	1.601	1.173	.139	1.365	.175
	Existence of Intellectual Property Policy	5.511	1.991	.276	2.768	.007
	Existence of ITSO Franchise	-4.372	2.177	-.200	-2.008	.047

2.908 holding all other independent variables constant. Moreover, the existence of ITSO Franchise will also increase the utilization performance by 4.372 as expressed in the following model:

$$\widehat{UP} = 5.511(EIP) + 2.908(FTF) + 4.372\,(ITSO) - 10.782$$

where: $\widehat{UP}$ is the estimated number of IP examined/search report conducted by HEI
EIP is the existence of IP Policy
FTF is the number of full time faculty
ITSO is the existence of ITSO Franchise

Utilization performance of private HEIs and their profile variates

Table 17 shows the correlation between the utilization performance of private HEIs and their profile variates. The SPSS Model summary as shown in Table 17 contained the following information: R=.332, R square=.634, and

Adjusted R square= .572. For private HEIs, none of the nine independent variables is statistically significant (>.05). However, when evaluating the

Table 17. Coefficients for the Utilization Performance of Private HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.812	.090		8.987	.000
	No. of Academic Programs w/ IP	.028	.017	.162	1.679	.095
	Status of Accreditation	-.001	.017	-.007	-.069	.945
	No. of Full Time Faculty	7.840E-005	.000	.148	1.835	.068
	Max. Teaching Load	.003	.003	.067	.971	.332
	R&D Budget	.013	.015	.104	.917	.360
	IP Budget	.027	.025	.114	1.080	.281
	Existence of IP Policy	.054	.096	.139	.564	.574
	Existence of ITSO Franchise	-.073	.078	-.216	-.948	.347
	Accrediting Agency	.015	.010	.129	1.563	.120

a. Dependent Variable: Utilization Performance

standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is the existence of ITSO Franchise (beta=-.216)

Licensing performance of public HEIs and their profile variates

Table 18 shows the correlation between the licensing performance of public HEIs and their profile variates. The SPSS Model summary as shown in Table 18 contained the following information: R=.342, R square=.431 and

Adjusted R square= .142. The result shows that almost fifty percent of the total variability is explained by the eight profile variates of public HEIs. Moreover, five of the eight independent variables are statistically significant (>.05). These are number of academic programs (p-value=.043); maximum teaching load (p-value=.000); R&D Budget (p-value=.001); IP budget (p-value=0.38); and existence of IP policy (p- value=.007). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable are in the following order: R&D Budget (beta=.264), IP Budget (beta=.201) and maximum teaching load (beta=.201).

Furthermore, the model predicts that at coefficient =-3.104, an increase in R&D Budget will increase the number of technology being licensed or commercialized by a public HEI by 3.462 while an increase of IP Budget, number of academic programs which can generate potential IP will also increase the same by 6.530 and 1.218 respectively holding all other independent variables constant. Moreover, the existence of IP Policy will also increase the utilization performance by 1.239 as expressed in the following model:

$$\widehat{LP} = 3.462(RDB) + 6.530(IPB) + 1.239(EIP) + .805(MTL) + 1.218(AP) - 3.104$$

where: $\widehat{LP}$ is the estimated number of technology licensed or commercialized by HEI
EIP is the existence of IP Policy
RDB is the R&D Budget
IPB is the IP Budget
MTL is the maximum teaching load of faculty
AP is the number of academic programs with IP

Table 18. Coefficients for the Licensing Performance of Public HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-3.104	.882		-3.521	.001
	No. of Academic Programs w/ IP	1.218	.134	.152	1.332	.043
	Status of Accreditation	-.027	.162	-.020	-.230	.059
	No. of Full Time Faculty	.010	.002	.023	.585	.559
	Max. Teaching Load	.805	.033	.201	2.264	.000
	R&D Budget	3.462	.142	.264	2.551	.001
	IP Budget	6.530	.243	.201	2.086	.038
	Existence of IP Policy	1.239	.439	.089	.350	.007
	Existence of ITSO Franchise	-.459	.847	-.099	-.474	.096
	Accrediting Agency	.154	.085	.111	1.478	.141

a. Dependent Variable: Licensing Performance

Licensing performance of private HEIs and their profile variates

Table 19 shows the correlation between the licensing performance of private HEIs and their profile variates. The SPSS Model summary as shown in Table 19 contained the following information: R=.435, R square=.571, and Adjusted R square= .437. For private HEIs, only one of the nine independent variables is statistically significant (>.05) which is the IP Budget (p-value= .001) However, when evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is still the IP Budget (beta=-.219).

Furthermore, the model predicts that at coefficient =.732, an increase of the Intellectual Property (IP) Budget will increase the number of technology being licensed or commercialized by a public HEI by 1.219 holding all other independent variables constant as expressed in the following model:

$$\widehat{LP} = 1.219\,(IPB) - .732$$

where: $\widehat{LP}$ is the estimated number of technology licensed or commercialized by HEI
IPB is the IP Budget

Table 19. Coefficients for the Licensing Performance of Private HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.732	.096		9.553	.000
	No. of Academic Programs w/ IP	.038	.032	.152	2.070	.095
	Status of Accreditation	-.012	.021	-.017	-.021	.945
	No. of Full Time Faculty	6.840E-015	.000	.143	1.025	.068
	Max. Teaching Load	.013	.000	.098	.871	.332
	R&D Budget	.003	.005	.004	.517	.060
	IP Budget	1.219	.015	.101	1.021	.001
	Existence of IP Policy	.054	.027	.126	.464	.564
	Existence of ITSO Franchise	-.063	.056	-.136	-.842	.247
	Accrediting Agency	.025	.012	.131	1.260	.080

a. Dependent Variable: Licensing Performance

Innovation ecosystem of public HEIs and their profile variates

Table 20 shows the correlation between the innovation ecosystem of public HEIs and their profile variates. The SPSS Model summary as shown in Table 20 contained the following information: R=.523, R square=.674 and Adjusted R square= .426. The result shows that sixty-seven percent of the total variability is explained by the eight profile variates of public HEIs. Moreover, only one of the

Table 20. Coefficients for the Innovation Ecosystem of Public HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.333	.560		4.165	.000
	Academic Programs	.106	.063	.154	1.692	.093
	Status of Accreditation	.049	.076	.061	.640	.524
	Number of full time faculty	.000	.000	-.045	-.469	.640
	Max Teaching Load (hours/week)	-.024	.018	-.116	-1.341	.182
	R&D Budget (2015)	.027	.065	.046	.410	.682
	Intellectual Property Budget (2015)	-.019	.102	-.018	-.184	.854
	Existence of Intellectual Property Policy	5.855	.172	.360	3.805	.000
	Existence of Franchise	.103	.188	.052	.546	.586

a. Dependent Variable: Innovation Ecosystem

eight independent variables is statistically significant (>.05) which is the existence of IP policy (p-value=.000). The result further shows that there is a 100

percent chance that a true relationship exist between the existence of IP Policy and HEIs innovation ecosystem.

When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is the existence of IP Policy (beta=.360). Furthermore, the model predicts that at coefficient =2.333, existence Intellectual Property (IP) Policy will improve the innovation ecosystem of a public HEI by 5.855 rated as "Encouraging" holding all other independent variables constant as expressed in the following model:

$$\widehat{IEP} = 5.855\,(EIP) - 2.333$$

where: $\widehat{IEP}$ is the innovation ecosystem of HEI
EIP is the existence of IP Policy

Innovation ecosystem of private HEIs and their profile variates

Table 21 shows the correlation between the innovation ecosystem of private HEIs and their profile variates. The SPSS Model summary as shown in Table 21 contained the following information: R=.669, R square=.447, and Adjusted R square= .723. Seventy-two percent of the variance is explained by the predictors. The R Square in a multiple regression represents explained variance that can be contributed to all the predictors in a progression Moreover, for private HEIs, three of the nine independent variables are statistically significant (>.05). These are: R & D Budget (p-value=.000), maximum teaching load (p-value=.001) and existence of IP policy (p-value=.017).

Table 21. Coefficients for the Innovation Ecosystem of Private HEIs and their Profile Variates

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.334	.345		6.757	.000
	No. of Academic Programs w/ IP	.045	.064	.053	.697	.486
	Status of Accreditation	.016	.064	.019	.251	.802
	No. of Full Time Faculty	.000	.000	-.070	-1.097	.274
	Max. Teaching Load	1.042	.013	-.179	-3.273	.001
	R&D Budget	1.284	.056	.456	5.107	.000
	IP Budget	-.020	.096	-.017	-.208	.836
	Existence of IP Policy	6.888	.368	.471	2.414	.017
	Existence of ITSO Franchise	-.297	.297	-.181	-1.003	.317
	Accrediting Agency	.065	.037	.114	1.751	.081

a. Dependent Variable: Innovation Ecosystem

When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is the existence of IP Policy (beta=.471) and R & D Budget (beta=.456). Furthermore, the model predicts that at coefficient =2.334, the existence Intellectual Property (IP) Policy will improve the innovation ecosystem of a public HEI by 6.888 rated as "Highly Encouraging" holding all other independent variables constant. The increase of R&D Budget will likewise increase the same by 1.284 as expressed in the following model:

$$\widehat{IEP} = 6.888\,(EIP)+1.042\,(MTL)+1.284(RDB) - 2.334$$

where: $\widehat{IEP}$ is the innovation ecosystem of HEI
EIP is the existence of IP Policy

MTL is the maximum teaching load
RDB is the R&D Budget

Significant relationship among the performance indicators of public HEIs

The significant relationship among the four performance indicators of public HEIs is presented in Table 22. When Pearson correlation test was performed among the performance indicators of public HEIs, the following correlations were obtained:

creation performance/utilization performance (r=.869/p=.000);

creation performance/administrative performance (r=.992/p=.000);

innovation ecosystem/creation performance (r=.225/p=0.10);

innovation ecosystem/utilization performance (r=.182/p=.038);

utilization performance/administrative performance (r=.881/p=.000)

licensing performance/innovation performance (r=.113/p=.041)

licensing performance/creation performance (r=.641/p=.0.12)

licensing performance/utilization performance (r=.534/p=.001)

administrative performance/innovation performance (r=.200/p=.022)

administrative performance/licensing performance (r=.654/p=.008)

The correlations showed themselves positive, that is, all five indicators complement each other. However, the strongest correlation are found to be between creation performance and administration performance (r=.992/p=.000).

Table 22. Correlation of the Performance Indicators of Public HEIs

		Innovation Ecosystem	Creation Performance	Utilization Performance	Licensing Performance	Administrative Performance
Creation Performance	Pearson Correlation	.225**	1	.869**	.641**	.992**
	Sig. (2-tailed)	.010		.000	.012	.000
	N	131	131	131	131	131
Innovation Ecosystem		1				
	Pearson Correlation		.225**	.182*	.113	.200*
	Sig. (2-tailed)		.010	.038	0.41	.022
	N	131	131	131	131	131
Utilization Performance	Pearson Correlation	.182*	.869**	1	.534*	.881**
	Sig. (2-tailed)	.038	.000		.001	.000
	N	131	131	131	131	131
Licensing Performance	Pearson Correlation	.113	.641**	.534*	1	.654
	Sig. (2-tailed)	.011	.012	.001		.008
	N	131	131	131		131
Administrative Performance	Pearson Correlation	.200*	.992**	.881**	.0771	1
	Sig. (2-tailed)	0.22	.000	.000	.032	
	N	131	131	131	131	131

*. Correlation is significant at the 0.05 level (2-tailed).

The results of the correlation test showed the higher the administration performance, the greater is the creation performance of a private HEI. Further, it can resolved that the number and support of people working related to IP plays a significant role in improving the creation performance of a public HEI.

Significant relationship among the performance indicators of private HEIs

When Pearson correlation test was performed among the performance indicators of private HEIs, the following correlations were obtained:

creation performance/ utilization performance (r=.472/ p=.000);

creation performance/ administrative performance (r=.919/ p=.000);

innovation ecosystem/ creation performance (r=.153/ p=.023);

innovation ecosystem/ utilization performance (r=.113/ p=.094);

utilization performance/ administrative performance (r=.563/ p=.000)

licensing performance/ innovation performance (r=.828/ p=.000)

licensing performance/ creation performance (r=.567/ p=.002)

licensing performance/ utilization performance (r=.870/ p=.024)

administrative performance/ innovation performance (r=.217/ p=.001)

administrative performance/ licensing performance (r=.456/ p=.002)

The correlations showed themselves positive except for the relationship between utilization performance and innovation ecosystem. The strongest correlation however, are found to be between creation performance and administration performance (r=.919/ p=.000).

The results of the correlation test showed that the higher the administration performance, the greater is the creation performance of a public HEI. Hence, it can be concluded that the number and support of people working related to IP plays a vital role in improving the performance of private HEI in terms of creating technologies and innovation for protection.

Table 23. Correlation of the Performance Indicators of Private HEIs

		Creation Performance	Innovation Ecosystem	Utilization Performance	Licensing Performance	Administrative Performance
Creation Performance	Pearson Correlation	1	.153*	.472**	.567**	.919**
	Sig. (2-tailed)		.023	.000	.002	.000
	N	220	220	220	220	220
Innovation Ecosystem	Pearson Correlation	.153*	1	.113	.828*	.217**
	Sig. (2-tailed)	.023		.094	.000	.001
	N	220	220	220	220	220
Utilization Performance	Pearson Correlation	.472**	.113	1	.870**	.563**
	Sig. (2-tailed)	.000	.094		.024	.000
	N	220	220	220	220	220
Licensing Performance	Pearson Correlation	.567**	.828*	.870**	1	.456
	Sig. (2-tailed)	.002	.000	.024		.002
	N	220	220	220	220	220
Administrative Performance	Pearson Correlation	.919**	.217**	.563**	.456	1
	Sig. (2-tailed)	.000	.001	.000	.002	
	N	220	220	220	220	220

*. Correlation is significant at the 0.05 level (2-tailed).

Problems encountered in filing, maintaining IP assets and technology transfer

The problems encountered by public HEIs are presented in Figure 12. The greatest problem as perceived by public HEIs was on the "lack of training on patent drafting, searching and filing of IP" with 344 responses (89 percent) followed by "lack of capability for patent drafting, search, filing etc.." with 324 responses (84 percent). The least problem seen by public HEIs was on the "slow or no internet connection for patent searching" with 85 responses (84 percent)

patent drafting, searching and filing of IP" with 344 responses (89 percent) followed by "lack of capability for patent drafting, search, filing etc.." with 324 responses (84 percent). The least problem seen by public HEIs was on the "slow or no internet connection for patent searching" with 85 responses (84 percent) and the "lack of awareness on basic information regarding IP and technology transfer".

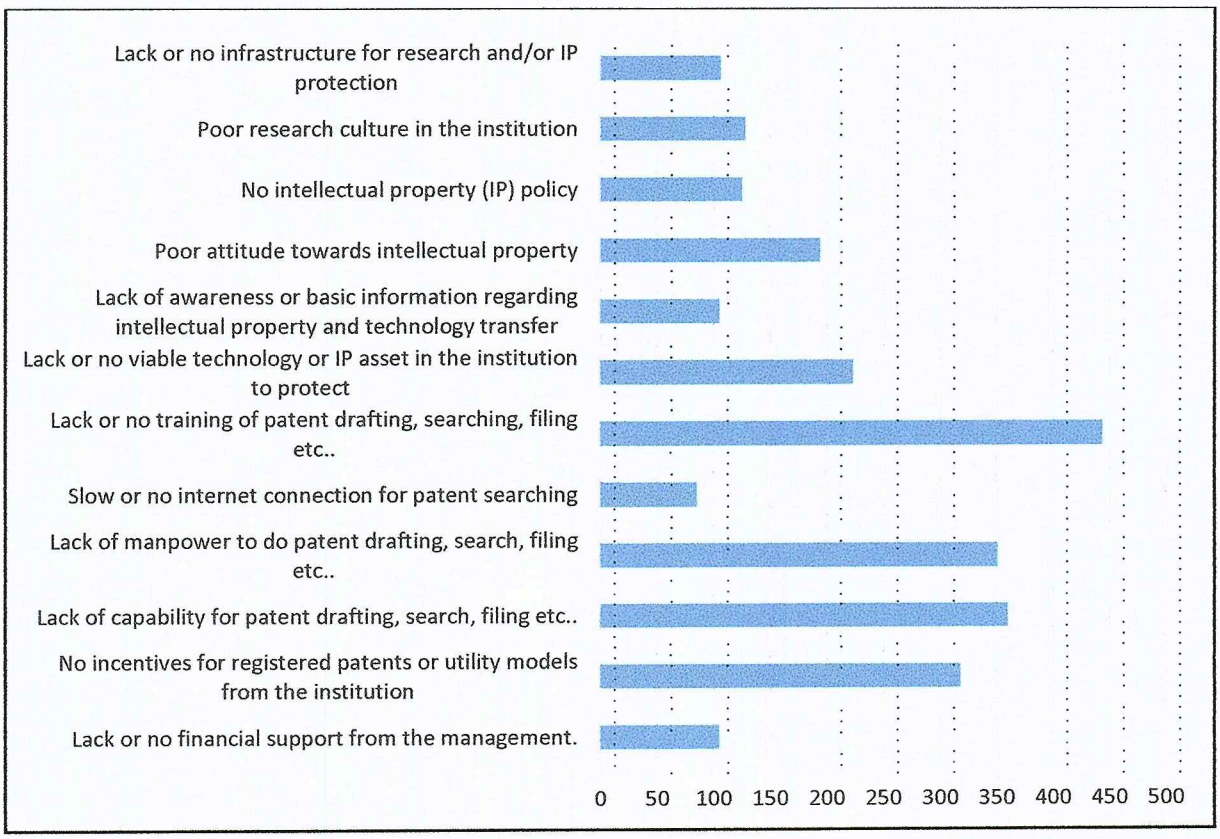

Figure 12. Problems encountered in IP Protection as rated by public HEIs

The problems encountered by private HEIs are presented in Figure 13. The greatest problem as perceived by private HEIs was on "lack of awareness on basic information regarding IP and technology transfer" with 375 responses (95

percent) followed by "no intellectual property (IP) Policy" with 344 responses (87 percent). The least problem seen by private HEIs was on the "slow or no internet connection for patent searching" with 85 responses (22 percent) and the "lack of financial support from the management" with 105 responses (27 percent).

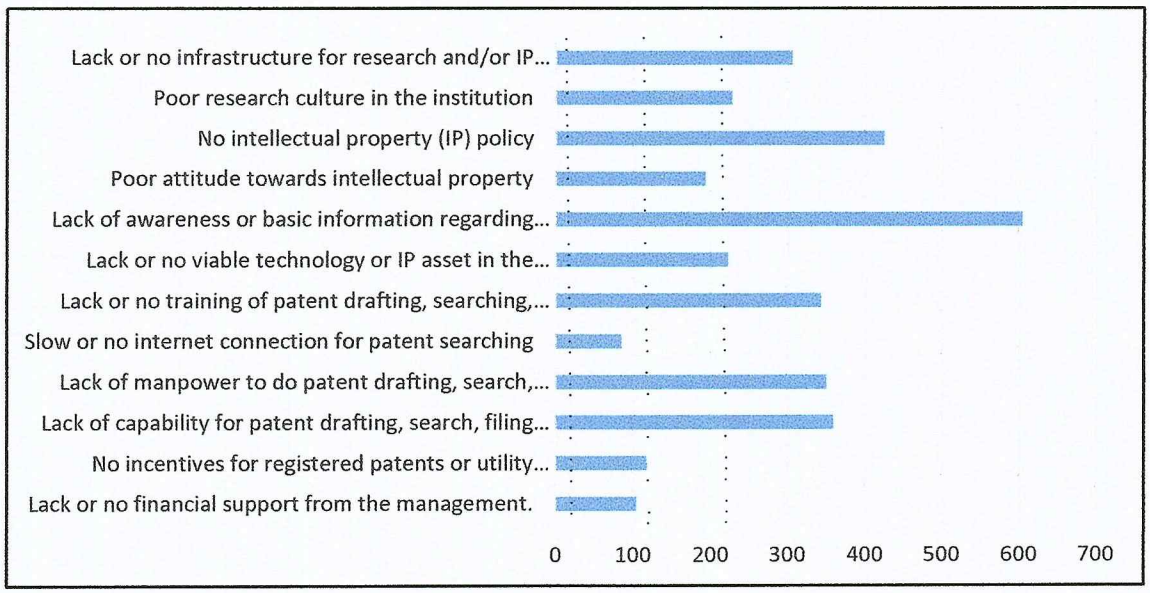

Figure 13. Problems encountered as rated by private HEIs

Results of the In-depth Interview

The in-depth interview was conducted to the top performing HEI in technology protection and licensing. The aimed of the interview was to determine the factors that contribute to their performance in terms of IP protection and licensing. The following questions were asked:

1. How do you describe your institution's performance in terms of IP protection and commercialization?

2. What do you think are the factors that contribute to the success or failure of your endeavor with regards to IP protection and commercialization?
3. What are the problems/obstacles you encountered in terms of IP protection and commercialization?
4. How your institution did resolved these problems?
5. What are your future endeavors with regards to IP protection and commercialization?

Each of the interview questions and responses were summarized and presented in Table 24. Five of the HEIs were chosen for an in-depth interview based on their performance from both technology protection and licensing. The University of San Carlos (USC) of Cebu City, University of the Philippines-Manila and University of the Philippines- Diliman are three HEIs which have been successful in technology protection and commercialization.

Cebu Technological University was chosen because of its performance in technology protection as the HEI who has the highest registered IP. The outlier among the group, the Mapua Institute of Technology (MIT) was also chosen in the conduct of the in-depth interview.

Table 24. Interview Results

Question	USC (Dr. Danilo Largo)	UP-Manila (Dr. Fe Yu)	UP-Diliman (Mr. Ace C. Acosta)	MIT (Dr. Jonathan Salvacion)	CTU (Dr. Corazon Macachor)
1. How do you describe your institution's performance in terms of IP protection and commercialization?	It's still a work in progress. We need to train more people to draft our technologies and manage the new start-up.	The good thing in UP-Manila is that we have experts and lawyers to do our patent drafting. With regards to commercialization, the University was able to licensed technologies. One of which is the Lagundi syrup in 2011 with Pascual Laboratories and earned millions.	The University is doing quite well, we do a lot of training to our faculty and students especially in patent drafting and searching. We also started doing patent services outside of UP. For commercialization, finally the University was able to launched CoaTiN or the Titanium Nitride Thin Film Formation on Metal Substrate by Chemical Vapor Deposition in 2014.	The focus of the University is to conduct patent services outside the University as an income generating activity of the University, we cater to a lot external clients, of course for a fee. For my part, I go around the Philippines to talk about IP, more on IP education.	The University is constantly conducting researches and outputs are required to be developed as technology package in preparation for our application for protection.
2. What do you think are the factors that contribute to the success of your endeavor with regards to IP protection and	It's the support of the management emotionally and financially, we have state-of-the art laboratories for our researches and now we operate the new bio-refinery plant. For the researchers, patience is a	You see, UP is heavily funded by the government especially in the area of research, that is really one big factor for the success of UP.	It's still the support of the government and system itself. The help of PCIEERD and ASET helped the market validation and commercial release of the product.	The management of MAPUA has been supportive in the IPOPHL's advocate of demystifying the patent system. And so IP education within the	Leadership. As early as 2010, the University is already filing for patent and utility models. Back then, we are encouraged and supported by the administration to protect all our

	commercialization?	virtue, there might be failures but it's the courage to move forward despite of discouragements.			University is strongly encouraged and even its part of our curriculum. For commercialization, the University developed a Noodle Vending Machine that is now being utilized by Nissin.	technologies.
3.	What are the problems/obstacles you encountered in terms of IP protection and commercialization?	It took us 3 years to finally launched the technology(GEMS, Inc.) problems would be lack of time because of our job at the same time teachers but the management has been supportive.	UP has been successful in its endeavor in tech transfer, however, current feedbacks from the inventors discouraged us to do licensing because inventors are left out with very meager amount because of the sharing scheme although somehow the University has benefited to this activity.	The problem in UP-Diliman is that we are very few in the Tech Transfer Division and mostly does not have permanent positions. Those that were already trained have tendency to leave UP and hence we run out of people.	The University has a lot of generated technologies especially by the students, however, the IP Policy of the University gave the freedom to students to file their own patent and under their names.	The problems of protection of our IP was our lack of capacity to do patent drafting and up until now we are not into it
4.	How your institution did resolved these problems?	All the researchers were given special de-loading and incentives.	For most inventors in the University like me, we now resolved to start-ups, building our own company with our developed technologies. It might not be as lucrative as licensing but	What the institution did was to hire and train new people, we are still for a permanent positions in the Office.	Not yet since we do don't perceived it as a problem.	We are planning to join the IPOPHL's ITSO for us to be trained in patent drafting and searching.

		it's fulfilling.			
5. What are your future endeavors with regards to IP protection and commercialization?	Hopefully, we plan to expand our bio-refinery plant to be able to increase our production.	We plan to finally launched our start-ups and we have started to market our products. Because of the reputation of the University to developed medicines, it has become easy for us to market our products.	Most of the work in the Office is to established linkages for tech transfer of our technologies. Hopefully, we will be able to launch more technology for commercialization.	Just to continue with what we are doing.	We hope that we would be included in the list of Patent Libraries and be able to train a critical mass of patent drafters and searchers.

All five HEIs that were included in the in-depth interview have one thing in common. They all agreed that the support of the management or its leadership plays a critical role to the success of their endeavor in technology protection and commercialization. Each of the HEIs have encountered different problems in their quest for innovation. These include the lack of time in doing patent activities and technology transfer, lack of manpower due to temporary positions, problems on profit-sharing in licensing, lack of capability in patent drafting and searching and limitations due to IP Policy. Despite these obstacles, these five HEIs were able to achieve milestones such as launching the first few start-up companies in the Philippines.

Chapter 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

This chapter provides a summary of the results of this study. Conclusions were discussed based on the researcher insights gained regarding study findings and limitations. In addition, recommendations are also presented.

Summary of Findings

The following were the findings based from the data collected and on the analyses performed in this study:

1. There were a total of 781 individual respondents from 351 public and private higher education institutions in the Philippines. Of these, 131 (37 percent) are public HEIs and the other 220 (62.6 percent) are private HEIs.
2. Majority of the respondents are faculty researchers with 476 (61 percent) of the total respondents while the other 305 (39 percent) are from the management personnel composed of the President, Vice President/Vice Chancellor for Research, Research Directors, Research Staff and IP Personnel.
3. The National Capital Region (NCR) had the highest respondents from both institution and individual respondents having 69 (20 percent) HEIs respondents and 128 (16 percent) individual respondents from both private and public HEIs.

4. As to profile of HEIs in terms of academic programs with IP applications, the Engineering programs got the highest IP applications with 57.5 percent of the total responses. This was followed by the Industrial Technology with 51.8 percent of the responses and Agriculture and related field with 28.9 percent of the total responses. The academic programs Accountancy and Business Administration and Criminology got the lowest percentage of 0.9 percent and 0.3 percent respectively.
5. As to profile of HEIs in terms of status of accreditation, most of the public respondents are CHED Level III HEI with 37 (28.2 percent) and regulated HEIs with 149 (68.3 percent) for private HEI respondents.
6. As to profile of HEIs in terms of accrediting agencies, all public or 38 percent of the total HEI respondents had the Accrediting Agency of Chartered Colleges and Universities in the Philippines (AACUP). For private institutions, the Philippine Association of Colleges and Universities Commission on Accreditation (PACU-COA) top the accrediting agency with 17 percent of the total HEI respondents followed by the Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU) at 16 percent.
7. As to profile of HEI respondents in terms of number of full time faculty, majority of the faculty from both private and public HEIS are in the range if 50-200. On the other hand, private HEIs had the most number of faculty

that are below 50 with 68 or 31 percent of the total private HEI respondents.

8. As to profile of respondents in terms of maximum teaching load of full time faculty, most or 41 percent of the private HEI respondents had teaching loads of 24 hours per week followed by teaching load of 21 hours per week with 33 percent of the total private HEIs. Conversely, most or 40 percent of the public HEIs had teaching load of 21 hours per week with 30 percent of the total public HEI respondents.

9. As to profile of respondents in terms of franchisee of the Innovation Technology Support Office (ITSO), majority or 283 (81 percent) of the HEO respondents are not ITSO franchise while the other 68 (19 percent) are ITSO institutions. Of these, 44 are public HEIs while the other 24 are private HEIs.

10. As to profile of HEI respondents in terms of R & D Budget, majority or 113 (51 percent) of private HEIs had the lowest range of R&D Budget of Less than Five hundred thousand (in pesos) R&D Budget followed by Between 1.1 Million-3 Million (in pesos) with 48 (22 percent) with a difference of 29 percent. For public HEIs, the range Between 1.1 Million-3 Million got the highest response with 23 percent followed by the range Between 3.1 Million-6 Million with 27 (21 percent).

11. As to profile of HEI respondents in terms of IP Budget, majority or 169 (77 percent) of the private HEIs does not have budget allocation for their

Intellectual Property (IP) protection. Meanwhile, 47 (36 percent) of the public HEI respondents responded that they do not have allocation for IP protection. Further, 37 (28 percent) and 30 (14 percent) of public and private HEIs posted that their budget allocation for IP is Below Five hundred thousand, respectively. Only one HEI posted a budget allocation of between 3.1 Million-6 Million and between 2.1 Million-3 Million, they are: Adamson University (AU) and De La Salle University-Manila, respectively.

12. As to profile of HEI respondents in terms of existence of IP Policy, majority or 222 (63 percent) of the HEI respondents does not have an IP Policy. Of these, 182 or 52 percent are coming from the private HEIs. Conversely, 91 (26 percent) public HEI respondents and 40 (11 percent) private HEIs has an IP Policy.

13. On creation performance of HEI respondents in terms of number of IP applications, public Level IV institutions composed the bulk of IP applications with 362 (45 percent) of the total IP applications filed from 17 institutions. This was followed by public Level III institutions with 237 (29 percent) of the totals IP applications filed by 22 institutions. On the other hand, only 22 (3 percent) of the total applications came from private HEIs. For private HEIs, majority of the IP applications are coming from the regulated institutions which constitutes 150 (68 percent) of the total

private HEI respondents. Both autonomous and deregulated private institutions had 11 (15 percent) IP applications.

14. On creation performance of HEI respondents in terms of technology fields according to WIPO classification, majority or 231 (49 percent) of technologies submitted by HEI respondents to IPOPHL are related to food. This was followed by pharmaceuticals and organic chemistry products both at 6 percent. Other technologies applied by the Philippine HEIs include electrical machineries/ apparatus, machine tools, IT methods for management, computer technology, telecommunications and other consumer goods.

15. On administration performance of HEI respondents in terms of number of IP examinations, 76 (21.7 percent) of the HEI respondents are doing patent and utility examinations. Of these, 58 (16.5 percent) are public HEIs with a total of 897 (91 percent) IP examinations and 18 (5.1 percent) are private HEIS with 84 (9 percent) IP examinations. Public Level IV HEI had the most number of with 366 (37.3 percent) IP examinations followed by public Level III HEI with 340 (34.7 percent) IP examinations.

16. On administration performance of HEI respondents in terms of filing a PCT report, only 4 (1.1 percent) of HEIs made it in the international arena by filing an international patent application. They are: University of the Philippines-Manila, University of the Philippines-Diliman, Adamson University and De La Salle University.

17. On utilization performance of HEI respondents, 36 or 10.3 percent of the HEI respondents have registered patents and/or utility models. Of these, 448 (98 percent) are from public HEIs while the other 6 (2%) are from private HEIs.

18. On licensing performance of HEI respondents, only three (3) HEIs was able to do licensing and commercialization of their protected IP. They are: University of the Philippines-Diliman with their titanium nitride coating, University of the Philippines-Diliman with their Lagundi formulation and University of San Carlos with their biochemical processing of bio-organic wastes from processed mango.

19. On innovation ecosystem of public HEI respondents, most of the respondents agreed to the statement "My institution have a fully aligned strategic innovation agenda" with a mean of 4.08 rated as "Strongly Agree". This was followed by the statement "My institution have a visible senior management (President, VP, Deans, Directors), involvement towards innovation and maximization of its benefits with a mean of 3.66 with corresponding rating of "Agree". Conversely, the statement "My institution have a well-defined yet flexible execution process, having a dedicated team who performs and has established a track record(i.e. innovation awards, registered IPs, commercialized technologies, etc.)" got the lowest mean of 2.86 rated as "Neither agree nor disagree".

20. On innovation ecosystem of private HEI respondents, the statement "My institution have a fully aligned strategic innovation agenda" got the highest mean of 2.84 rated as "Neither agree or disagree". This was followed by the statement "My institution have a creative, resourceful, multi-functional and highly dedicated skilled research and IP team" with a mean of 2.79 also rated as "Neither agree or disagree". On the other hand, the statement "Personnel and students in my institution understand the importance of innovation" got the lowest mean of 2.19 with corresponding rating of "Disagree".
21. On the overall rating of HEI respondents on state of innovation ecosystem in their institution, public HEIs rated their institution as "encouraging" while private HEIs rated their institution as "neither encouraging nor discouraging".
22. Among the eight profile of public HEIs, at level 0.05 significance, only one was statistically significant with creation performance of HEIs and that is, the existence of IP Policy (p-value=.003). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the creation performance of HEIs is still the existence of IP Policy (beta=.290) and is followed by the number of full time faculty (beta=.170). Furthermore, the model predicts that at constant coefficient=-3.260, that

the existence of IP Policy will increase the creation performance of a public HEI by 2 holding all other independent variables are constant.

23. Among the nine profile of private HEIs, at level 0.05 significance, three are statistically significant with creation performance of private HEIs. These are: number of academic programs with IP applications (p-value=.007), maximum teaching load (p-value=.007) and number of full time faculty (p-value=.036). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the creation performance of private HEIs was the number of academic programs with IP applications (beta=.248).

24. Among the eight profile of public HEIs, at level 0.05 significance, two were statistically significant with administration performance of HEIs, and that these are: existence of IP Policy (p-value=.019) and number of full time faculty (p-value=.046). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable is still the existence of IP Policy (beta=.235) and is followed by the number of full time faculty (beta=.201).

25. Among the nine profile of private HEIs, at level 0.05 significance, three were found to be statistically significant with the administration performance of private HEIs. These are: maximum number of teaching load (p-value=.002), R&D Budget (p-value=.011) and IP Budget (p-value=.038). When evaluating the standard beta values or "size of

influence" (Vogt, 1993, p.20), the greatest influence upon the administration performance was the R&D Budget (beta=.264) and is followed by IP Budget (beta=.201) and maximum teaching load (beta=.201).

26. Among the eight profile of public HEIs, at level 0.05 significance, three were found to be statistically significant with utilization performance of HEIs, these are: existence of IP Policy (p-value=.007), number of full time faculty (p-value=.016) and existence of ITSO Franchise (p-value=.047). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the dependent variable are in the following order: existence of IP Policy (beta=.276), number of full time faculty (beta=. 245) and existence of ITSO Franchise (beta=-200).

27. Among the nine profile of private HEIs, at level 0.05 significance, none was found to be statistically significant with utilization performance of private HEIs. However, when evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the utilization performance was the existence of ITSO Franchise (beta=-.216).

28. Among the eight profile of public HEIs, at level 0.05 significance, only one was found to be statistically significant with innovation ecosystem of HEIs and that is, the existence of IP policy (p-value=.000). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest

influence upon the dependent variable is the existence of IP Policy (beta=.360).

29. Among the nine profile of private HEIs, at level 0.05 significance, three were found to be statistically significant with innovation ecosystem of private HEIs and these are, R & D Budget (p-value=.000), maximum teaching load (p-value=.001) and existence of IP policy (p-value=.017). When evaluating the standard beta values or "size of influence" (Vogt, 1993, p.20), the greatest influence upon the innovation ecosystem, were the existence of IP Policy (beta=-.471) and R & D Budget (beta=.456).

30. On determining the correlation between the four performance indicators of public HEIs, the following correlations were obtained: creation performance/utilization performance (r=.869/p=.000); creation performance/administrative performance (r=.992/p=.000); innovation ecosystem/creation performance (r=.225/p=0.10); innovation ecosystem/utilization performance (r=.182/p=.038); utilization performance/administrative performance (r=.881/p=.000); licensing performance/innovation performance (r=.115/p=.041); licensing performance/creation performance (r=.641/p=.0.12); licensing performance/utilization performance (r=.534/p=.001); administrative performance/innovation performance (r=.200/p=.022); administrative performance/licensing performance (r=.654/p=.008). The strongest

correlation are found to be between creation performance and administration performance (r=.992/p=.000).

31. On determining the correlation between the four performance indicators of private HEIs, the following correlations were obtained: creation performance/utilization performance (r=.472/p=.000); creation performance/administrative performance (r=.919/p=.000); innovation ecosystem/creation performance (r=.153/p=.023); innovation ecosystem/utilization performance (r=.113/p=.094); utilization performance/administrative performance (r=.563/p=.000); licensing performance/innovation performance (r=.828/p=.000); licensing performance/creation performance (r=.567/p=.002); licensing performance/utilization performance (r=.870/p=.024); administrative performance/innovation performance (r=.217/p=.001); administrative performance/licensing performance (r=.456/p=.002). The strongest correlation are found to be between creation performance and administration performance (r=.919/p=.000).

32. The greatest problem as perceived by public HEIs was on the "lack of training on patent drafting, searching and filing of IP" with 344 responses (89 percent) followed by "lack of capability for patent drafting, search, filing etc.." with 324 responses (84 percent). The least problem seen by public HEIs was on the "slow or no internet connection for patent

searching" with 85 responses (84 percent) and the "lack of awareness on basic information regarding IP and technology transfer".

33. The greatest problem as perceived by private HEIs was on "lack of awareness on basic information regarding IP and technology transfer" with 375 responses (95 percent) followed by "no intellectual property (IP) Policy" with 344 responses (87 percent). The least problem seen by private HEIs was on the "slow or no internet connection for patent searching" with 85 responses (22 percent) and the "lack of financial support from the management" with 105 responses (27 percent).

34. Five of the HEIs were chosen for an in-depth interview based on their performance from both technology protection and commercialization. The University of San Carlos (USC) of Cebu City, UP-Manila and UP-Diliman are three HEIs which have been successful in commercialization. Cebu Technological University was chosen because of its performance in technology protection as the HEI who has the highest registered IP. The outlier among the group, the Mapua Institute of Technology (MIT) was also chosen in the conduct of the in-depth interview. All five HEIs that were included in the interview have one thing in common. They all agreed that the support of the management or its leadership was key to the success of their endeavor in technology protection and commercialization. Each of the HEIs have encountered different problems in their quest for innovation. These include the lack of time in

doing patent activities and tech transfer, lack of manpower due to temporary positions, problems on profit-sharing in licensing, lack of capability in patent drafting and searching and limitations due to IP Policy. Despite these obstacles, these five HEIs were able to achieve milestones such as launching the first few start-up companies in the Philippines.

35. Most of the higher education institutions (HEIs) in the Philippines does not have written policy or strategic management plans for the protection and licensing of their generated technologies or intellectual property.

Conclusions

Based on the above findings, the following conclusions were derived:

1. All 351 higher education institutions in the Philippines vary in terms of number of full time faculty, academic programs offered, teaching loads of faculty, status of accreditation, accrediting agencies, R&D Budget, IP Budget and policies. Hence, each higher education institutions had their own distinctive nature and characteristics.
2. Higher educational institutions (HEIs) with technology-related academic programs tend to produce technologies for protection.
3. For public HEIs, the creation performance or the capacity to create technologies of HEIs is directly proportional to the level of accreditation. The higher the level of accreditation, the higher the performance in the

patent/utility model applications. However, this is not true with private HEIs.

4. Technologies related to food dominates the Philippine technology landscape. Classification of technologies submitted to IPOPHL was based on technology fields according to WIPO classification.
5. Public HEIs performed better than the private HEIs in terms of number of IP examinations.
6. The performance of Philippine HEIs in terms of filing an international patent application is poor.
7. The Philippine HEIs from both public and private are slowly shifting from simply protecting their technologies to commercialization as there are few HEIs who have started start-ups and licensing their technologies.
8. Most public HEIs are aware of the importance of innovation and are moving towards maximization of its benefits. On the other hand, innovation is still insignificant to most private HEIs.
9. The existence of IP Policy is strongly correlated with the creation performance of public HEIs.
10. The number of academic programs, number of teaching load and number of faculty are strongly correlated with the creation performance of private HEIs.
11. The existence of IP Policy and the number of full time faculty are strongly correlated with the administration performance of public HEIs.

12. The maximum number of teaching load, R&D Budget and IP Budget are the determining factor for the administration performance of private HEIs.
13. The existence of IP Policy, number of full time faculty and the existence of an ITSO franchise are strongly correlated with utilization performance of public HEIs while none of the variables are correlated with private HEIs.
14. The existence of IP Policy is strongly correlated with the innovation ecosystem of both public and private HEIs.
15. There is a strong correlation between creation performance and administration performance in both public and private HEIs.
16. The lack of training on patent drafting, searching and filing was the most perceived problem by public HEIs while for private HEIs, it's the lack of awareness on basic information regarding IP and the absence of IP Policy.
17. Most of the higher education institutions (HEIs) in the Philippines has poor performance in the protection and licensing of their generated technologies and could be associated with the absence of IP policy or strategic management plans for the protection and licensing of their intellectual property.

Recommendations

Based on the above findings and conclusions, the following are hereby recommended:

1. There is a need to develop a technology protection and licensing plan for both public and private higher education institutions (HEIs) in the Philippines that will serve as a guide to improve their performance in innovation and commercialization.
2. Concerned government agencies such as CHED, DOST etc. should introduce new policies to stimulate the need to have an IP Policy thereby encourage technology protection of universities and enable the commercialization of research products from both public and private HEIs.
3. Work towards a more effective and widespread dissemination on the importance of IP and provide trainings related to IP protection and commercialization.
4. Provide resources that aid in facilitating the IP protection and commercialization process such as documents, training materials and seminars and should be made available to students, faculty members and other interested employees. Topics should include IP protection, commercialization pathways, market assessments and technology readiness.
5. Recognize students and faculty member's contributions towards innovation and commercialization by providing incentives or awards so that participation in these activities brings fulfillment and enhances an academic career.

6. Develop undergraduate and graduate curriculum to introduce students to innovation and technology transfer.
7. Ensure clearly articulated and transparent share of net royalties that are reasonably distributed, transparent conflict of interest and conflict of commitment policies and procedures so that faculty can participate in IP protection and commercialization activities with confidence that the fundamental obligations of teaching, research and service are maintained. The University should develop a framework that ensures relationships of this nature are supported and effectively managed.
8. HEIs should establish an Innovation and Technology Transfer Office, define responsibilities, develop supporting resources and recruit professional staff.
9. Develop an innovation strategy that will ensure that a culture of innovation becomes embedded in the fabric of the institution.
10. HEIs should pursue IP protection and commercialization to maximize the further development, use and beneficial social impact of their technologies.
11. Support innovation within the community by providing a mechanism for local businesses to access HEIs infrastructure and resources.
12. Reduce the maximum teaching load of faculty to give opportunity to engage in research, innovation and technology transfer activities.

13. Further investigation and a more in-depth analysis on the staffing, time and other resources needed for a successful technology transfer.

Chapter 6

STRATEGIC TECHNOLOGY PROTECTION AND LICENSING MANAGEMENT PLAN FOR HIGHER EDUCATION INSTITUTIONS IN THE PHILIPPINES

Introduction

IP is a valuable strategic and financial asset for every institution. Like any other resource, IP should be carefully managed. Without appropriate management, the institution may be unaware of its IP, its value or benefits, or may expose itself to unnecessary risks. An IP asset when properly managed can motivate and help generate revenues from products and sales; help retain and motivate technical personnel; stimulate research and development (R&D) based industries and creates employment and promotes funding for R & D, which provides and enhances needed technologies and products. It can also attract high-value foreign investments and joint ventures, provide bargaining power in technology transfer negotiations and help gain access to goods and technologies through licensing agreements.

I. DEFINING ORGANIZATION GOALS

An institution should be able to define its goals. To be able to articulate the best management plan, it is very important to understand first institution's mission and vision, short and long terms goals, history, product and innovation

pipeline, tolerance to risks, name recognition, partnerships, financial, operational & technical strength, ability to raise capital rapidly, exit strategy and timing thereof, etc.

II. IP ASSESSMENT

Step 1: IP AUDIT-Identifying existing IP and the need for new IP . An IP Audit is a mechanism to assess existing and potential stock of IP and human capital of a certain institution. This is also called an appraisal of the internal innovative resources. IP Audit can provide an objective, comprehensive picture of existing strategies, infrastructure, capacity, needs, competitive advantages and challenges of an organization. In determining the appropriate breadth and depth of an IP audit, factors such as importance of various IP assets, business goals and objectives of the institution and logistics should be initially considered.

Step 2. Establish policies that encourage IP creation and protection. Research and development activities allow scientists and researchers to develop new knowledge and technologies. It plays an important role in the development of innovations and new technology. Hence, an *R&D policy* is very important for an institution.

An *IP policy* is important if not a must to an institution that's primary function is to continually search for new knowledge. The IP policy is a guide that delineates rights, responsibilities and obligations of the institution, the members

of the community and other interesting parties. It is a statement of principles governing the institution's management and practices in relation to IP. The presence of an IP policy is meant to encourage protection of inventions, creative works and enable technology transfer for the benefit of the public. The policy should be tailored according the institutions' mission and vision. It should contain the following principles:

PRINCIPLE	CONTENT
Policy Objective	Summary of the organization's aims and business objectives, including an explanation of how the creation, protection, management and exploitation of IP are important for achieving those aims and objectives.
Scope	Overview of the persons to whom the IP policy will apply, such as employees and contractors, visitors and volunteers of the organization and its related entities. The scope may also limit the application of the IP policy to certain types of IP.
Nature and forms of IP	Outline of the different forms of IP commonly created or acquired by the organization, and the particular forms of IP that are of most value to the organization.
Identification and reporting of IP	Guidance on how to recognize an IP asset that may have potential commercial value to the organization, including an explanation of the need to report all newly developed IP for the organization to determine how best to protect and explore it.
Ownership of IP	Direction on the organization's policy regarding ownership of IP developed by employees, contractors, visitors, volunteers and other third parties.
Protection of IP	Explanation of the importance of actively protecting IP and the consequences if protection is not maintained. This should include guidance on how to make IP protection decisions for each form of IP that is relevant to the organization.
Management of IP	Procedures for the proper management of IP including: the conduct of periodic reviews of existing IP assets the ongoing decision-making process regarding IP protection and commercialization, and disposal of IP.
IP Valuation	Guidance on the organization's approach to quantitative and qualitative valuations of IP.
Exploitation of IP	Guidance on the instances when commercialization of IP is appropriate and the issues to consider when making IP commercialization decisions. This section should also provide information on what authorizations are necessary when making IP commercialization decisions.

Recognition of employee contribution	Policy on how the organization recognizes employee contribution to the development of IP.
Potential conflicts of interests	Explanation of potential conflicts of interest that may arise in relation to the ownership, management, protection or exploitation of IP, and guidance on how to avoid or deal with such conflicts.

Step 3: Gather all information on all intellectual property rights. An organization should be able to identify and catalogued its IP assets to be able to understand its value. A list should be prepared to enumerate all IP assets such as patents, trademarks, industrial designs, copyrights and trade secrets. The checklist may contain the following:

Information to be obtained:
Description of the IP asset, including form, expression and format
Date of creation
Expected date of expiration of IP rights
Details of creators, including inventors and other contributors to patentable inventions
Status of all creators (such as employee or contractor)
Where the IP asset was acquired from a third party, description of the relationship
Details of any commercial dealings, e.g. licences, assignments
Potential risks associated with the IP asset
Details of any third party claims regarding the IP asset
Details of any encumbrances, such as mortgages, charges or other third party interests in the IP asset.

Source: Intellectual Property Management, Spruson & Ferguson, 2007

Step 4: Identify human resources. The human resource of an organization is the foundation of IP asset developmnent. Hence, it is a must that there should

be people who will manage IP assets of the organization. The human capital for IP includes a manager who has the ability to manage intellectual property assets, IP technical experts such as patent drafters and searchers and an office clerk.

III. GENERAL MANAGEMENT FOR IP MANAGEMENT

3.1 Ownership of Intellectual Property

3.1.1 Creator/Inventor

Intellectual property which is unrelated to an individual's employment responsibilities and developed on his or her own time without the support of the employer or institution or any of its members or significant use of their facilities, the IP is owned by the creator or inventor. The institution therefore should recognize and affirm the academic freedom of both faculty, staff and students to publish scholarly or artistic works without restrictions.

3.1.2 Institution-owed

Under the Article II Sec 30.3b of RA 8293, all IP created by an employee or staff in the course of their employment belongs to the organization. Hence, all IP conceived or developed as a result of activities related to an individual employment responsibilities, and/or with support from the institution or any of its members in the form of administered funds, and/or with significant use of resources, shall be owned by and is assigned to the institution by such

individuals. Nevertheless, it is good practice to ensure that employment contracts contain express provisions governing IP ownership. This may include clauses to the effect that: all IP generated, modified or improved by the employee in the course of his or her employment with the organization will vest in the organization, and the employee will sign all necessary documents to assign the IP to the employer.

3.1.3 IP Involving Sponsored Research

IP conceived or developed in the course of or resulting from research supported by a grant or contract with governmental entities or a non-profit or for-profit nongovernmental entity shall be owned by the institution. However, the research sponsor has an option to acquire license rights to develop and commercialize any intellectual property resulting from the project.

3.2 Decision Making Body

A decision making body that may take a form of a technology management committee that can address matters related to IP management and technology transfer/commercialization is important. The structure of the committee will be dependent on the structure of the institution. However, the following may be recommended:

President	Chairman
VP/Head Research	Co-chairman

IPO Director/Head	Member
Tech Transfer Head	Member
Director/s, Research Centers	Member
Dean/Head originating IP	Member
Finance Officer	Member
Budget Officer	Member
Experts in Law/Economics	Member

The Chairman of the committee can invite experts/officers depending on the issues/ concerns at hand. The committee will decide matters relating to IP management, such as IP ownership, licensing/transfer of technologies, sharing of profits, financial ceilings, asset management, risk and contract management, financial approval and budgeting, record keeping etc.

3.2 Confidentiality Agreement

All concerned scientists, employees and students shall enter into appropriate confidentiality agreement before divulging any undisclosed information, research results/ know-how before any audience including conferences, seminars, trainings and the like. Confidentiality of the technological aspects/IP must be ensured.

Concerned institution or individual shall maintain proper and authenticated records with respect to IP generated and disclosed securing

maintenance of IPR protection, commercialization and incentives, and sharing of commercial benefits with the concerned personnel. They shall periodically submit reports to IPO/ Research Office.

4 PROCEDURES FOR MANAGEMENT OF PATENTS AND UTILITY MODELS

Not all subject matter generated or acquired by an institution may need IP protection. The subject matter should pass the patentability test under the law before it can be applied for protection. It also important to know that the decision to implement IP protection for a particular subject matter may occur before, during or after its creation. An innovator can already identify the subject matter that would require IP protection as early as the planning stage of a research project.

4.1 Initial Application

An interested inventor or maker may approach the Head/Director of Research or IP Office of the institution and indicate his/her interests in making a confidential disclosure of an IP generated or likely to be generated by the inventor or maker. Each application of an inventor or maker should undergo an initial patent search to determine the novelty of the application and determine the form of protection is appropriate to the application.

4.2 Patent

A patent is a temporary monopoly in return for disclosing an invention. It is an exclusive right to exploit the invention for 20 years. Any research results or subject matter in any field of technology, whether processes or products which are new, inventive (non-obvious) and useful (industrially applicable). However some subject matter cannot be patented under the law. These are:

- Business concepts or procedures
- Scientific laws or discoveries
- Problem-solving methods or ways of displaying information
- Rules for games
- Computer software
- Animal or plant breeds/varieties
- Medical procedures (but drugs, surgical instruments etc. can be patented in themselves)
- Works of art, novels, poems, and drawings - copyright
- Ornamental appearance of an object - industrial design
- Words, phrases or logos – trademarks
- Anything contrary to public order and morality

4.3 Utility Model

A utility model is a right given by the government for research results or subject matter in any field of technology, whether processes or products which are new (novel) and useful (industrially applicable) for 7 years from the date of

filing and is nonrenewable.

4.4 Basic Requirements of a Grant

To be patentable, an invention must be new or novel. It shall not be consider new if it forms part of a prior art. A prior art is everything made available to the public by means of written description, oral description, by use or any otherway. However in the Philippines, if an invention have already been disclosed or published in a journal, demonstrate, sell or discuss your invention in public, it can still be filed a patent within one (1) year from the date of disclosure or publication.

An invention or subject matter that can be produced and used in any industry shall be industrially applicable (Sec. 27, RA 8293). An invention involves an inventive step, if having regard to prior art; it is not obvious in the person skilled in the art. A person skilled in the art is a fictional person and able to understand regardless of what language it is in, and all the common knowledge of the art in question. The person has no inventive step and imagination to do inventive activity.

A mere change of size, making a product portable, reversal of parts, change of materials, a mere substitution of parts by an equivalent part or function are some of examples of an 'obvious invention'.

4.5 Parts of an Application

A patent application usually contains six parts. The title of the invention or utility model, background of the invention/utility model, summary, detailed description, claims and abstract. The title should be as short and specific as possible and should appear as a heading on the first page of the specification. Acceptable terms should be used while fancy names are not permissible. This part describes a brief description of the relevant prior art of the subject matter and its shortcomings.

The summary of the invention or utility model should contain a disclosure or a general statement, which the claim invention is to solve or at least alleviate. The detailed description of the invention or utility model is the meatiest part of the document. It should accurately and adequately describe the invention and how to practice it. It should be able to give examples and results. The extent of protection is determined by the terms of the claims.

4.6 Complete Application

A complete application is one that has completed all the necessary parts of an application including an filled out application form. A complete application is examined by the Intellectual Property Office of the Philippines through a Formal Examination to determine if it satisfies the sufficiency of description and clarity of claims. It will be then published for 18 months at the Intellectual Property Office of the Philippines E-Gazette for a patent application while a

month for Utility Model. On the other hand, a patent document will undergo a Substantial Examination to determine if it satisfies the requirements of a grant.

If the earlier patent application described more than one invention, then one or more divisional applications may be used to separately protect the other inventions without loss of priority date.

4.7 PCT Application

PCT application also known as an international application allows you to apply for patent protection in a number of different countries through one international agency, provided that the countries are signatories to the Patent Cooperation Treaty. However, the PCT application will need to be 'nationalized' to the different countries of interest before a relevant deadline for local examination and grant to occur. Separate applications are necessary in those countries of interest not signatories to the Patent Cooperation Treaty.

4.8 Disclosure Requirements

It is necessary that the concerned PI/scientists/innovators make sufficient disclosure that fully defines the invention, its feasibility and application so that patent or utility model can be granted on that disclosure without any objection.

The complete disclosure made by an inventor or maker will be collated to prepare the patent IP application for filing in the Intellectual Property Office of

month for Utility Model. On the other hand, a patent document will undergo a Substantial Examination to determine if it satisfies the requirements of a grant.

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The complete disclosure made by an inventor or maker will be collated to prepare the patent IP application for filing in the Intellectual Property Office of

the Philippines (IPOPHL). A trained patent drafter or lawyer of the institution may draft the application particularly the complete specifications and claims.

4.9 Filing a patent or utility model application

A patent or utility model application may be filed by a patent agent of IP representative at the IPOPHL in Taguig City, Manila to secure the priority date of the application. The IP Office of the institution will maintain the patents obtained by them by paying the requisite fees at the respective patent offices. Initially, they will pay the renewal fees over a five years period and depending upon some headway in the process of technology transfer or commercialization they may renew the patent for any further period.

5 PROCEDURES FOR MANAGEMENT OF OTHER FORMS OF IP

Others forms of intellectual property include copyright, trademark and industrial design.

5.1 Copyright

Copyright is a legal protection given to authors/creators for their literary and artistic works. There are eight categories of protected forms of expression.

Categories of Work	Examples
Literary works	All written works, including reports, lyrics, poems, books, software, database
Artistic works	Photographs, drawings, paintings, sculptures, architecture,

	graphs, computer icons
Dramatic works	Plays, screenplays, choreographic works
Musical works	All works with written musical notation, including sheet, music, operas
Cinematographic works	All works generating moving images, including films, computer games
Sound recordings	All works with recorded sound, including CDs, DVDs, mp3, podcasts
Broadcasts	Television and radio broadcasts
Published editions	Publisher's typeface and layout of a published work

Source: Intellectual Property Management, Spruson & Ferguson, 2007

Category of Work	Economic rights granted
Literary, dramatic and musical works	Reproduction Communication to the public Publication Performance in public Making adaptations Entering into commercial rental agreements
Artistic works	Reproduction Communication to the public Publication
Sound recordings and cinematographic works	Copy Communication to the public Cause to be seen or heard in public Enter into commercial rental agreements (sound recordings only)
Broadcasts	Make a film or television copy Make a copy of the sound recording of the broadcast Rebroadcast or communicate to the public
Published editions	Make a facsimile copy of the published edition

Source: Intellectual Property Management, Spruson & Ferguson, 2007

5.2 Ownership of Copyright

Ownership of copyright on any copyright work may be expressed in any of the following:

- by putting the symbol ©
- may be made using the statement 'All rights Reserved' or 'Permission granted to reproduce for academic use only.

6 TECHNOLOGY TRANSFER/ COMMERCIALIZATION OF IP

The final goal of any research activity is to finally commercialize the resulting IP products. The main purpose of IP commercialization is to generate income. According to Herdman (1995), the ability of the nation to sustain economic growth, increase its standard of living, and improve human health and the environment depends, in many ways, on its success in developing and commercializing new products, processes, and services. However, IP commercialization is a complicated process and requires many factor to consider including the product enhancement, potential market and the resources such as financial budget.

6.1 Common Forms of IP Commercialization

6.1.1 Licensing. It is a process of leasing a legally protected entity or intellectual property in conjunction with a product (Licensing Expo, 2017).

An IP license grants another entity the right to access and use the IP for a certain time period where such access or use would otherwise infringe the right of the IP owner (Spruson & Ferguson, 2007). A license may be exclusive, sole or non-exclusive and may be restricted to a particular territory or field. Exclusive license is when licensee is the only person who has the right to deal with the licensed IP, even to the exclusion of the licensor while sole licensing is when licensee is the only person who has the right to deal with the licensed IP in addition to the licensor. On the other hand, Non-exclusive license is when the licensor grants licenses to third parties.

6.1.2 Assignment. It is a permanent transfer of the ownership of the IP asset to another entity. IP is assigned in exchange for a financial consideration usually in the form of lump sum payment, royalties or a combination of both.

6.1.3 Start-up companies. This is considered as the most complex and expensive form of commercialization. Using this form usually need larger long term return and requires extensive additional development.

6.1.4. Joint ventures. This is a collaboration of two or more parties into a contractual arrangement setting out their rights and obligations in relation to the project. The IP license is often combine with a development agreement contract whereby the parties divide up responsibilities and IP ownership with respect to research development of an agreed technology

or product.

6.2 Distribution of Royalties, License Fees and Sale Proceeds

The distribution of royalties, license fees and sale proceeds is dependent on the governing policy of the institution. However the following scheme maybe followed:

Step 1. Deduct from gross royalties, license fees or sale proceeds the cost of obtaining legal protection for the intellectual property and payments to any third party to arrive at net income.

Step 2. Distribute forty percent (40%) of net income to the creator/s as personal income.

Step 3. Distribute the remaining sixty percent (60%) of net income to the institution when the institution decide on the sharing of the said income.

6.3 Technology Transfer Instruments

Technology transfer instruments are those instruments or tools that will aid in the implementation of technology transfer activities.

Fact Sheets. These are quick, simple, one-page descriptions of developed technologies, patent licensing opportunities, and potential partnerships. These may be available electronically through the Internet and World Wide Web, and are suitable for distribution as paper copies at exhibits, conferences, and trade

showcases. They are designed to stimulate interest and provide points-of-contact for additional information.

Publications. The developed technologies of HEIs can be published in refereed journals, open file reports and other technical media for wider dissemination.

Videotapes. This is very good instrument for demonstrating a product or process to better describe research developments and attract attention. Videotapes are often used at exhibits and showcases; in these applications, the length of videotapes should be kept to 2 minutes or less to hold viewer attention.

Exhibits. Static displays held at trade shows and conferences. Exhibits may range from small tabletop displays requiring no attendant to large showcases encompassing several hundred square feet of exhibition space and requiring a large staff. The purpose of a federally sponsored exhibit (for example, information dissemination, advertisement of partnering opportunities, or heightening awareness of new technology) should be clearly understood before an exhibit is planned.

Internet marketing. Highlighting technology transfer opportunities through World Wide Web can be effective in increasing visibility. These can also stimulate the interest of potential customers and partners in DOI technology.

EXCLUSIVE LICENSE AGREEMENT
(Sample only)

This Agreement is made effective the ___ day of _____, ____, by and between Samar State University (hereinafter called "SSU"), and _____ (hereinafter called "Licensee"), a corporation organized and existing under the laws of _____;

Section 1. Definitions.

For the purpose of this Agreement, the Appendix A definitions shall apply.

Section 2. Grant.

A. License.

SSU hereby grants to Licensee under the Licensed Patents an exclusive license to make, use and sell Products in the Licensed Field and Licensed Territory.

B. Reservation of Rights.

SSU hereby reserves the right to grant non-profit research institutions and governmental agencies non-exclusive licenses to practice and use the inventions of the Licensed Patents for Non-Commercial Research purposes. SSU and the inventors of the Licensed Patents shall have the right to publish any information included in the Licensed Patents.

C. License to SSU.

(i) Licensee hereby grants to SSU a nonexclusive, royalty-free, irrevocable, paid-up license, with the right to grant sublicenses to non-profit

research institutions and governmental agencies, to practice and use "Improvements" for Non-Commercial Research Purposes. "Improvements" shall mean any patented modification of an invention described in the Licensed Patents that (1) would be infringed by the practice of an invention claimed in the Licensed Patents; or (2) if not for the license granted under this Agreement, would infringe one or more claims of the Licensed Patents. Licensee shall provide SSU with a written, enabling disclosure of each such invention, unambiguously identifying it as an invention governed by this paragraph, within six (6) months of the issuance of a patent thereon.

(ii) In the event that Licensee discontinues the use or commercialization of the Licensed Patents or any Improvements provided for under this Agreement, Licensee hereby agrees to grant to SSU an option to obtain a nonexclusive, royalty-bearing license, with the right to grant sublicenses, to practice and use said Improvements for commercial purposes. Licensee shall provide to SSU written notice that Licensee intends to discontinue such use or commercialization immediately upon making such a decision. SSU's option with respect to each Improvement shall expire sixty (60) days after SSU's receipt of said written notice from Licensee. The failure of SSU to timely exercise its option under this paragraph shall be deemed a waiver of SSU's option, but only with respect to the Improvement so disclosed.

Section 3. Development.

Licensee agrees to and warrants that it has, or will obtain, the expertise necessary to independently evaluate the inventions of the Licensed Patents and to develop Products for sale in the commercial market and that it so intends to develop Products for the commercial market. Further, Licensee agrees to provide SSU with a development plan encompassing at least the information set forth in Appendix E describing the steps necessary to allow the inventions of the Licensed Patents to be utilized to provide Products for sale in the commercial market. In addition, within one month following the end of each semi-annual period ending on June 30 and December 31 until the Date of First Commercial Sale of Products, Licensee will provide SSU with a written Development Report summarizing Licensee's product development activities since the last Development Report and any necessary adjustments to the development plan. All development activities and strategies and all aspects of product design and decisions to market and the like are entirely at the discretion of Licensee, and Licensee shall rely entirely on its own expertise with respect thereto. SSU's review of Licensee's development plan is solely to verify the existence of Licensee's commitment to development activity and to assure compliance with Licensee's obligations to utilize the inventions of the Licensed Patents to commercialize Products for the marketplace, as set forth above. SSU reserves the right to audit Licensee's records relating to development of Products as required hereunder. Such record keeping and audit procedures shall be subject to the

procedures and restrictions set forth for audit of the financial records of Licensee in Section 6.

Section 4. Consideration.

C. Minimum Royalty.

Licensee further agrees to pay to SSU a minimum royalty of _____ per calendar year or part thereof during which this Agreement is in effect starting in calendar year _____, against which any earned royalty paid for the same calendar year will be credited. The minimum royalty for a given year shall be due at the time payments are due for the calendar quarter ending on December 31. It is understood that the minimum royalties will apply on a calendar year basis, and that sales of Products requiring the payment of earned royalties made during a prior or subsequent calendar year shall have no effect on the annual minimum royalty due SSU for any given calendar year.

Section 6. Recordkeeping.

A. Licensee shall keep books and records sufficient to verify the accuracy and completeness of Licensee's accounting referred to above, including without limitation inventory, purchase and invoice records relating to the Products or their manufacture. In addition, Licensee shall maintain documentation evidencing that Licensee is in fact pursuing development of Products as required herein. Such documentation may include, but is not limited to, invoices for studies advancing development of Products, laboratory

notebooks, internal job cost records, and filings made to the Internal Revenue Department to obtain tax credit, if available, for research and development of Products. Such books and records shall be preserved for a period not less than six (6) years after they are created during and after the term of this Agreement.

B. Licensee shall take all steps necessary so that SSU may within thirty (30) days of its request review and copy all the books and records at a single U.S. location to allow SSU to verify the accuracy of Licensee's royalty reports and Development Reports. Such review may be performed by any employee of SSU as well as by any attorney or registered CPA designated by SSU, upon reasonable notice and during regular business hours.

Section 7. Term and Termination.

A. The term of this license shall begin on the effective date of this Agreement and continue until this Agreement is terminated as provided herein or until the earlier of the date that no Licensed Patent remains an enforceable patent or the payment of earned royalties under Section 4B, once begun, ceases for more than eight (8) calendar quarters.

B. Licensee may terminate this Agreement at any time by giving at least ninety (90) days written and unambiguous notice of such termination to SSU. Such a notice shall be accompanied by a statement of the reasons for termination.

C. SSU may terminate this Agreement by giving Licensee at least ninety (90) days written notice if the Date of First Commercial Sale does not occur on or before _____, ____.

D. If Licensee at any time defaults in the timely payment of any monies due to SSU or the timely submission to SSU of any Development Report, fails to actively pursue the development plan, or commits any breach of any other covenant herein contained, and Licensee fails to remedy any such breach or default within ninety (90) days after written notice thereof by SSU, or if Licensee commits any act of bankruptcy, becomes insolvent, is unable to pay its debts as they become due, files a petition under any bankruptcy or insolvency act, or has any such petition filed against it which is not dismissed within sixty (60) days, or offers any component of the Licensed Patents to its creditors, SSU may, at its option, terminate this Agreement by giving notice of termination to Licensee.

Section 8. Assignability.

This Agreement may not be transferred or assigned by Licensee without the prior written consent of SSU.

Section 10. Enforcement.

SSU intends to protect the Licensed Patents against infringers or otherwise to act to eliminate infringement, when, in SSU's sole judgment, such action may be necessary, proper, justified and makes reasonable business sense considering all factors. In the event that Licensee believes there is infringement of any Licensed Patent under this Agreement which is to Licensee's substantial

detriment, Licensee shall provide SSU with notification and reasonable evidence of such infringement.

Section 11. Product Liability; Conduct of Business.

A. Licensee shall, at all times during the term of this Agreement and thereafter, indemnify, defend and hold SSU and the inventors of the Licensed Patents harmless against all claims and expenses, including legal expenses and reasonable attorneys fees, arising out of the death of or injury to any person or persons or out of any damage to property and against any other claim, proceeding, demand, expense and liability of any kind whatsoever resulting from the production, manufacture, sale, use, lease, consumption or advertisement of Products arising from any right or obligation of Licensee hereunder. SSU at all times reserves the right to select and retain counsel of its own to defend SSU's interests.

B. Licensee warrants that it now maintains and will continue to maintain liability insurance coverage appropriate to the risk involved in marketing the products subject to this Agreement and that such insurance coverage lists SSU and the inventors of the Licensed Patents as additional insured. Within ninety (90) days after the execution of this Agreement and thereafter annually between January 1 and January 31 of each year, Licensee will present evidence to SSU that the coverage is being maintained with SSU and its inventors listed as additional insured. In addition, Licensee shall provide SSU

with at least thirty (30) days prior written notice of any change in or cancellation of the insurance coverage.

Section 12. Use of Names.

Licensee shall not use SSU's name, the name of any inventor of inventions governed by this Agreement, in sales promotion, advertising, or any other form of publicity without the prior written approval of the entity or person whose name is being used.

Section 13. Confidentiality.

Both parties agree to keep any information identified as confidential by the disclosing party, confidential using methods at least as stringent as each party uses to protect its own confidential information. "Confidential Information" shall include Licensee's development plan and development reports, the Licensed Patents and all information concerning them and any other information marked confidential or accompanied by correspondence indicating such information is confidential exchanged between the parties hereto. Except as may be authorized in advance in writing by SSU, Licensee shall grant access to the Confidential Information only to its own employees involved in research relating to the Licensed Patents and Licensee shall require such employees to be bound by this Agreement as well. Licensee agrees not to use any Confidential Information to its advantage and SSU's detriment, including but not limited to claiming priority to any application serial numbers of the Licensed Patents in Licensee's patent prosecution. The confidentiality and use obligations set forth above apply to all or

any part of the Confidential Information disclosed hereunder except to the extent that:

(i) Licensee or SSU can show by written record that it possessed the information prior to its receipt from the other party;

(ii) The information was already available to the public or became so through no fault of the Licensee or SSU;

(iii) the information is subsequently disclosed to Licensee or SSU by a third party that has the right to disclose it free of any obligations of confidentiality; or

(iv) five (5) years have elapsed from the expiration of this Agreement.

Section 19. Authority.

The persons signing on behalf of SSU and Licensee hereby warrant and represent that they have authority to execute this Agreement on behalf of the party for whom they have signed.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement on the dates indicated below.

SAMAR STATE UNIVERSITY

By: _____ Date: _____, _____
President

LICENSEE

By: _____ Date: _____, _____
Name and Office: _____
_____

Reviewed by SSU's Attorney:
_____ _____, ____
Name

(SSU's attorney shall not be deemed a signatory to this Agreement.)

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APPENDICES

APPENDIX A

Republic of the Philippines
SAMAR STATE UNIVERSITY
College of Graduate Studies
Catbalogan City
Telephone Numbers: (055)-543-8394/(055)-251-2139
Website: www.ssu.edu.ph

April 12, 2016

DR. VICTORIA M. TAFALLA
Dean, College of Graduate Studies
Samar State University

Madam:

I have the honor to submit the following titles for my Dissertation Proposal.

It is my earnest desire to study one of these titles for my Dissertation preferably title number 1:

1. Technology Protection Performance of Higher Education Institutions (HEIs) in the Philippines

2. Patent information for strategic technology management in State Colleges and Universities in Eastern Visayas

3. Contribution of State Colleges and Universities in Eastern Visayas to Regional Innovation, Growth and Employment

I hope for your favorable action regarding this matter.

Respectfully yours,

(Sgd) VIVIAN L. MOYA
Researcher

APPROVED:

(Sgd) VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies

APPENDIX B

Republic of the Philippines
SAMAR STATE UNIVERSITY
College of Graduate Studies
Catbalogan City
Telephone Numbers: (055)-543-8394/(055)-251-2139
Website: www.ssu.edu.ph

To:

Dr. Marilym D. Cardoso
Dr. Ronald L. Orale
Dr. Eusebio T. PAcolor
Dr. Simon P. Babalcon Jr.
Dr. Bienvinido T. Balanlay

May I ask you to be a member of the committee to evaluate the attached dissertation title.

Please give your comments and suggestions which you will discuss with the proponent.

Thank you for your cooperation.

Very truly yours,

(Sgd) VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies

EVALUATION/RECOMMENDATIONS

_____

_____

_____

_____

_____

_____

APPENDIX C

Republic of the Philippines
SAMAR STATE UNIVERSITY
College of Graduate Studies
Catbalogan City
Telephone Numbers: (055)-543-8394/(055)-251-2139
Website: www.ssu.edu.ph

ASSIGNMENT OF ADVISER

DR. FELISA E. GOMBA
Vice President for Academic Affairs
Samar State University

Dear Madam:

Please be informed that you have been designated as adviser of MS. VIVIAN L. MOYA, candidate for the degree Doctor in Philosophy Major in Technology Management (PhD TM) who proposes to write a dissertation entitled **"TECHNOLOGY PROTECTION PERFORMANCE OF HIGHER EDUCATION INSTITUTIONS (HEIs) IN THE PHILIPPINES"**.

Thank you for your cooperation.

Very truly yours,

(Sgd) VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies

CONFORME:

(Sgd) FELISA E. GOMBA, Ph.D.
Vice President for Academic Affairs

APPENDIX D

Republic of the Philippines
SAMAR STATE UNIVERSITY
College of Graduate Studies
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Telephone Numbers: (055)-543-8394/(055)-251-2139
Website: www.ssu.edu.ph

DR. VICTORIA M. TAFALLA
Dean, College of Graduate Studies
Samar State University

Dear Madam:

May I have the honor to apply for pre-oral defense of my dissertation entitled "**TECHNOLOGY PROTECTION PERFORMANCE OF HIGHER EDUCATION INSTITUTIONS (HEIs) IN THE PHILIPPINES**" on the most convenient date of your office.

Very truly yours,

(Sgd) VIVIAN L. MOYA
Researcher

Recommending Approval:

(Sgd) FELISA E. GOMBA, Ph.D.
Vice President for Academic Affairs

APPROVED:

(Sgd) VICTORIA M. TAFALLA, Ph.D.
Dean, College of Graduate Studies

APPENDIX E

Republic of the Philippines
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Website: www.ssu.edu.ph

DR. VICTORIA M. TAFALLA
Dean, College of Graduate Studies
Samar State University

Dear Madam:

This dissertation entitled "TECHNOLOGY PERFORMANCE OF HIGHER EDUCATION INSTITUTIONS (HEIs) IN THE PHILIPPINES" is prepared and submitted by MS. VIVIAN L. MOYA in partial fulfilment of the requirements for the degree of Doctor in Philosophy, Major in Technology Management is recommended for Final oral examination on the date and time convenient to your office.

(Sgd) FELISA E. GOMBA, Ph.D.
Adviser

Survey Questionnaire on Technology Protection Performance of HEIs in the Philippines

Hi! I'm Vivian L. Moya, Director for Technology Licensing and Innovation Support Office and IPSO Manager of Samar State University located in Catbalogan City, Western Samar. I am presently doing my dissertation for my PhD major in Technology Management entitled "Technology Protection Performance of Higher Education Institutions (HEI's) in the Philippines". The study includes data mining of the Philippine patent database. This survey is one of the component of the study to find out the technology performance of HEIs in the Philippines by looking at its creation capacity, administration, utilization and the innovation ecosystem. FACULTY RESEARCHERS AND THOSE IN THE RESEARCH AND IP MANAGEMENT ARE PREFERRED TO PARTICIPATE IN THE SURVEY. Please find time to answer. There are questions that are required and you need to answer them before you can continue to the next question. This will only take a few minutes. Thank you and God bless..

* Required

The Author

1. What is the name of your institution? *

.....

2. What is your name?

.....

3 **What is your designation/position in your institution?** *

Check all that apply

- [ ] President/VC / Head
- [ ] IP Administrator/In-charge/Head
- [ ] Vice-President for Research including Vice Chancellor
- [ ] Research Specialists
- [ ] Research Coordinator/Staff
- [ ] ITSO Manager
- [ ] ITSO Technical Expert/ Technical Staff
- [ ] Faculty
- [ ] Research Director/Head
- [ ] Others

4 **What is your academic rank in your institution?**

Mark only one oval

- ( ) Instructor
- ( ) Assistant Professor
- ( ) Associate Professor
- ( ) Professor
- ( ) University Professor
- ( ) SRS
- ( ) Others

5 **What region do your institution belong? ***

Mark only one oval.

- NCR
- CAR
- Ilocos Region
- II Cagayan Valley
- III-Central Luzon
- IVA-CALABARZON
- IVB-MIMAROPA
- V-Bicol
- VI-Western Visayas
- VII-Central Visayas
- VIII Eastern Visayas
- IX Zamboanga Peninsula
- X- Northern Mindanao
- XI- Davao Region
- XII SOCCSKSARGEN
- XIII CARAGA
- ARMM
- Central Luzon

6. **Is your Institution public or private? ***

Mark only one oval.

- Private
- Public

7 **What is your institution level according to CHED?**

Mark only one oval.

- Deregulated
- Autonomous
- Not autonomous nor deregulated

8. **What is your institution level according to CHED?**
Mark only one oval.

- Level I
- Level II
- Level III
- Level IV

9. **What is your institution's accrediting agency?**
Mark only one oval

- Accrediting Agency of Chartered Colleges and Universities in the Philippines (ACCUP
- Association of Christian Schools and Colleges Accrediting Agency inc. (ACSC-AAI)
- Philippine Accrediting Association of Schools, Colleges and Universities (PAASCU)
- Philippine Association of Colleges and Universities Commission on Accreditation (PAC COA)
- Federation of Accrediting Agencies of the Philippines (FAAP)
- Others

10. **What is the total number of full time faculty in your institution?**

_____

11. **What is the maximum teaching load (no. of hours) in your institution?** *

_____

12. **Is your Institution a franchisee of the IPOPHL Innovation Technology Support Office (ITS**
Mark only one oval.

- Yes
- No

13. **What is your institution's current R&D Budget? (Note: A Faculty may not opt to answer thi question)**

Mark only one oval.

- Less than 500K
- Helween 500K - 1 Million
- 1.1 Million- 3 Million
- 3.1 Million - 6 Million
- 6.1 Million - 10 Million
- 10.1 Million- 50 Million
- 50.1 Million and Up

14. **From your institutions' R&D Budget, how much is allotted in protecting your IP? (Note: A Faculty may OR may not opt to answer this question)**

Mark only one oval.

- None
- Less than 500K.
- Between 500k -1 Million
- Between 1.1 Million -2 Million
- Between 2.1 Million -3 Million
- Between 3.1 Million -4 Million
- 5 Million and Up

15. **How many are your Institutions's total R&D Senior Research Managers? (i.e.VP Research, Research Director/Head) (Note: A Faculty may OR may not opt to answer this question)**

Mark only one oval.

- None
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 and Up

16. Please specify the number of your institutions' total R&D Senior Research Managers? (i.e.VP Research, Research Director/Head)

.....

17 How many are your institutions' total R&D Junior Research Managers? (i.e. Research coordinators, Research Specialist) (Note: A Faculty may OR may not opt to answer this question)

Mark only one oval

- ◯ None
- ◯ 1
- ◯ 2
- ◯ 3
- ◯ 4
- ◯ 5
- ◯ 6
- ◯ 7
- ◯ 8
- ◯ 9
- ◯ 10 and Up

18. Please specify the total number of your institutions' R&D Junior Research Managers? (i.e. Research coordinators, Research Specialist) (Note: A Faculty may OR may not opt to answer this question)

19. Are all your institution's Jr. Research Managers holds a permanent status? (i.e.rank and file, item holder) (Note: A Faculty may OR may not opt to answer this question)

Mark only one oval

- ◯ Yes
- ◯ No

20) Please specify the number of your institutions' Jr. Research Managers who does not have a permanent status?

.....

21 How many are your institution's total Research Staff? (i.e. Clerks, Research Assistants, Research Lab Assistants, Student Assistants) (Note: A Faculty may OR may not opt to answer this question)

Mark only one oval.

- None
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15 and Up

22. Please specify the total number of your institutions' research staff? (i.e. Clerks, Research Assistants, Research Lab Assistants, Student Assistants)

.....

23 Does your institution have an Intellectual Property (IP) Policy? *

Mark only one oval.

- No
- Yes

24. What year was IP Policy officially approved? (Note: A Faculty may OR may not opt to answer this question)

Mark only one oval

- 2000 and up
- 2001
- 2002
- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016

25. Does your institution submits your (institution) technology for protection?

Mark only one oval.

- No
- Yes

26. **From what program does your patent or utility model in your institution came from? (Note Faculty may OR may not opt to answer this question)**

Check all that apply.

- [ ] Education
- [ ] Engineering
- [ ] Nursing and Health Sciences
- [ ] Industrial Technology
- [ ] Fisheries and Marine Sciences
- [ ] Arts and Sciences
- [ ] Agriculture and related fields
- [ ] Information Technology and related fields
- [ ] Accountancy and Business administration
- [ ] HRM and Tourism
- [ ] Criminology
- [ ] General Science (Biology, Chemistry, Physics etc.)
- [ ] Management and related fields
- [ ] Graduate and Post graduate
- [ ] Others

27. **What type of protection did your institution sought? (You can tick more than one option) (Note: A Faculty may OR may not opt to answer this question)**

Check all that apply.

- [ ] Patent
- [ ] Utility Model
- [ ] Trademark
- [ ] Industrial Design
- [ ] Copyright
- [ ] Trade Secret

28. **How many patent/utility model examinations have your office done? (for IP Personnel only)**

_____

29. **Does your institution have an Intellectual Property Office/Personnel? (Note: A Faculty may O may not opt to answer this question)**

Mark only one oval.

- ( ) No
- ( ) Yes

30. How many are your institutions total IP personnel? (i.e. IP Director/Head/Administrators, IP Staff including Technology Transfer Staff)

Mark only one oval

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 and up

31. Who then takes charge of protecting your institution's technology or IP assets? *

Mark only one oval

- None at all
- The research personnel
- Tap services from other agency or institution
- The inventors/maker themselves

32. Please specify the number of your institutions total IP personnel? (i.e. IP Director/Head/Administrators, IP Staff including Technology Transfer Staff)

_____

33. Are all your institutions' IP personnel holds a permanent status? (i.e. rank and file, item holder)

Mark only one oval

- Yes
- No

34. Please specify the number of your institutions' IP personnel who does not have a permanent status? (i.e. rank and file, item holder)

35. Did your institution have commercialized any of your (institution) technology? *

Mark only one oval.

- No
- Yes

36) **What level of commercialization have your institution have undergone? (You can tick more than one option)**

Check all that apply

- [ ] Local
- [ ] Regional
- [ ] National
- [ ] International

37) **How many of your institutions' technology that have been commercialized LOCALLY?**

Mark only one oval

- ( ) None
- ( ) 1
- ( ) 2
- ( ) 3
- ( ) 4
- ( ) 5
- ( ) 6
- ( ) 7
- ( ) 8
- ( ) 9
- ( ) 10 and up

38. **Please specify what technologies commercialized LOCALLY?**

.....

39. **How many of your institutions' technology that have been commercialized in the REGIONAL level?**

Mark only one oval.

- ( ) None
- ( ) 1
- ( ) 2
- ( ) 3
- ( ) 4
- ( ) 5
- ( ) 6
- ( ) 7
- ( ) 8
- ( ) 9
- ( ) 10 and up

40. Please specify the what technology that institution has commercialized in the REGIONAL level?

41. How many of your institutions' technology that have been commercialized in the NATIO level?

Mark only one oval

- None
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10 and up

42. Please specify what institutions' technology that have commercialized in the NATIONAL level?

43. How many of your institutions' technology that have been commercialized in the INTERNATIONAL level?

Mark only one oval

- None
- 1
- 2
- 3
- 4
- 5 and up

44 Please specify what institutions' technology that have commercialized in the INTERNATIONAL level?

_____

45. Who commercializes your institution's technology? *

Mark only one oval.

- The institution itself
- Industry Partner
- Tap services of other agency/institution
- None

46. Kindly specify the technology commercialized and industry taker/partner:

.....

.....

.....

.....

47. Kindly specify the technology commercialized and agency/institution tapped to commercialize:

.....

48. Who pays for the IP asset (i.e patent, UM) application, registration and maintenance? *

Mark only one oval.

- Inventor/Maker
- Institution
- Part Institution, part inventor/maker
- None

49. Who files for the application of protection of IP in your institution? *

Mark only one oval.

- Inventor/Maker
- Research Personnel
- Institutions' IP Personnel
- Tap services of other agency/institution
- None

50. What patent database is available in your institution? *

Mark only one oval.

- Free Database
- Paid Database
- None

51 What free patent databases are used in your institution most of the time? (You can tick m
than one option)

Check all that apply.

- [ ] Google Patent
- [ ] PhilPat
- [ ] Espacenet (EPO)
- [ ] US Patent and Trademark Office (USPTO)
- [ ] Japan Patent Office (JPO)
- [ ] Patentscope (WIPO)
- [ ] Software for Intellectual Property (SIP Patent)
- [ ] PatoSmart.com
- [ ] PatMedia Hybrid Patent Image Retrieval Engine
- [ ] Patents.com
- [ ] PatentDocs
- [ ] Freepatentsonline.com
- [ ] FreshPatents
- [ ] SurfaBrain
- [ ] IP.com
- [ ] GotthoPatent
- [ ] PatentLens
- [ ] PatentFamily
- [ ] PatentTools
- [ ] WikiPatents
- [ ] PatSnap
- [ ] PatentStorm
- [ ] PatentGenius
- [ ] Others

52. **What paid patent database did your institution subscribed? (You can tick more than one option)**
Check all that apply.

- [ ] Thomson Innovation
- [ ] Dolphion
- [ ] Derwent Worlds Patetn Index (DWPI)
- [ ] Total Patents (Loxis Noxis)
- [ ] Orbit.com (Questel)
- [ ] PatBase/PatBaseXpress (Minesoft)
- [ ] STN
- [ ] WIPS Global
- [ ] Others

53. **Does your institution files for PCT (an International Patent System) application?**
Mark only one oval.

- ( ) No
- ( ) Yes

54. **How many PCT reports have you done? (for IP personnel only)**

55. **When did your institution started filing for PCT (an International Patent System) application?**
Mark only one oval

- ( ) 2000 below
- ( ) 2001
- ( ) 2002
- ( ) 2003
- ( ) 2004
- ( ) 2005
- ( ) 2006
- ( ) 2007
- ( ) 2008
- ( ) 2009
- ( ) 2010
- ( ) 2011
- ( ) 2012
- ( ) 2013
- ( ) 2014
- ( ) 2015
- ( ) 2016

56. **Please specify the year your institution started filing for PCT Application?**

.....

57. **Does your institution have PCT (an International Patent System) application approved/registered?**

Mark only one oval.

- ◯ No
- ◯ Yes

58. **What are the problems encountered in filing, maintaining your intellectual property assets and technology transfer? (You can tick more than one option) ***

Check all that apply.

- ☐ Lack or no financial support from the management
- ☐ No incentives for registered patents or utility models from the institution
- ☐ Lack of capability for patent drafting, search, filing etc..
- ☐ Lack of manpower to do patent drafting, search, filing etc..
- ☐ Slow or no internet connection for patent searching
- ☐ Lack or no training of patent drafting, searching, filing etc.
- ☐ Lack or no viable technology or IP asset in the institution to protect
- ☐ Lack of awareness or basic information regarding intellectual property and technology transfer
- ☐ Poor attitude towards intellectual property
- ☐ No intellectual property (IP) policy
- ☐ Poor research culture in the institution
- ☐ Lack or no infrastructure for research and IP protection

59. **Personnel and students in my institution understand the importance of innovation. ***

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

60. **My institution has a infrastructure for IP such as an IP Office and personnel for filing, registration and maintenance in the IPOPHL. ***

Mark only one oval.

	1	2	3	4	5	
Strongly Disagree	◯	◯	◯	◯	◯	Strongly Agree

61. **My institution have a fully aligned strategic innovation agenda.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

62 **My institution have a visible senior management (President, VP, Deans, Directors) involvement towards innovation and maximization of its benefits.** *

Mark only one oval

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

63. **My institution participates in IP-related activities in the International arena such attendance of international IP forum, conference and trainings.** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

64 **My institution have a creative, resourceful, multi-functional and highly dedicated skilled research and IP team.** *

Mark only one oval

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

65. **My institution supports filing of PCT (an International Patent System).** *

Mark only one oval.

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

66 **My institution supports the creation of the mind, facilitates registration and maintenance of IP.** *

Mark only one oval

	1	2	3	4	5	
Strongly disagree	◯	◯	◯	◯	◯	Strongly agree

67 **My institution have a well-defined yet flexible execution process, having a dedicated team who performs and has established a track record(i.e. innovation awards, registered IPs, commercialized technologies, etc.). ***

Mark only one oval

	1	2	3	4	5	
Strongly disagree	( )	( )	( )	( )	( )	Strongly agree

68. **Overall, how do you rate in institutions' innovation environment? ***

Mark only one oval.

	1	2	3	4	5	
Strongly discouraging	⬭	⬭	⬭	⬭	⬭	Strongly encouraging

VIVIAN L. MOYA

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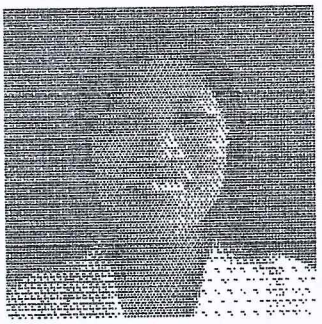

PERSONAL INFORMATION

Birthday	:	October 12, 1978
Birth Place	:	Marawi City, Lanao del Sur
Civil Status	:	Widowed
Nationality	:	Filipino
Height	:	1.52 m.
Weight	:	56 kg.
Skills	:	Researcher/Patent Drafter/Patent Searcher

FAMILY BACKGROUND

Spouse's Name	:	Capt. Santiago P. Moya Jr.
Name of Child	:	Vin Michelle L. Moya
Father's Name	:	Vivencio Castillo Lucaban
Mother's Name	:	Ligaya Bautista Lucaban

EDUCATIONAL QUALIFICATION

LEVEL	NAME AND ADDRESS OF SCHOOL	DEGREE/ COURSE	INCLUSIVE DATES		SCHOLARSHIP/ ACADEMIC HONORS RECEIVED
			From	To	
Post Graduate	Samar State University Catbalogan City, Samar	PhD in Technology Management	2012	2017	
Graduate Studies	Samar State University Catbalogan city, Samar	Master of Arts in Teaching Major in Chemistry	2005	2009	
College	Samar State University Catbalogan City, Samar	BSE Major in Physics/	1995	1999	CUM LAUDE

		Chemistry			Dean's Lister 1995-1999
Secondary	Agusan National High School Butuan City	High School	1991	1995	With Honors
Elementary	Camp Evangelista Elem. School	Elementary	1985	1991	With Honors

CIVIL SERVICE ELIGIBILITY

RA 1080 BOARD EXAM	RATING	DATE OF EXAMINATION/ CONFIRMATION	PLACE OF EXAM	LICENSE NUMBER	DATE OF RELEASE
PRC Licensure Examination for Teachers		March 6, 2001	Tacloban City	0697918	March 6, 2001
PD 907 Eligibility for Honor Graduate CUM LAUDE		March 15, 1999	Catbalogan City	10080038	March 1999

ACADEMIC EXPERIENCE

AREA OF WORK EXPERIENCE	POSITION TITLE	AGENCY	INCLUSIVE DATES		NO. OF YEARS
			From	To	
Academic	Associate Professor 1	SSU	01/02/2017	Present	
	Asst. Professor 1	SSU	01/02/2016	12/31/2016	1
	Instructor 3	SSU	01/4/2015	31/12/2015	1
	Instructor 1	SSU	09/1/2004	01/3/2015	10
	University Technical Reviewer	SSU	02/01/2011	Present	-
	ITSO (Innovation and Technology Support Office) Manager	SSU/IPOPHL	02/02/2012	Present	4
	Director, Technology Licensing and Innovation Support Office	SSU	03/19/2013	Present	3

RESEARCH EXPERIENCES AND ACHIEVEMENTS

FUNDED RESEARCH PROJECTS

TITLE OF THE PROJECT	FUNDING AGENCY	AMOUNT (PHP)
Value-Chain Analysis of Blue Swimming Crabs in Samar (On-going)	SSU	131,000.00
Development Thermally-prepared products from Mussels	SSU	100,000.00
Level of Health Research Utilization in Eastern Visayas (On-going)	DOH/PCHRD	360,000.00
Development of Value-Added Products from Cogon Grass (On-going)	SSU	60,000.00
Validation of Technology for Identified GIA Community Based Projects in Eastern Visayas: Upgrading of Banana Chips Utilizing the Fruit Slicing Machine Developed by Samar State University	DOST/TAPI	332,000.00
Practices, Systems and Issues on Solid Waste Management in Catbalogan City, Samar	SSU	20,000.00
Level of Health Research Utilization in Samar (Phase 1)	SSU	60,000.00
Development and Evaluation of Organic Piscicide from Local Flora	SSU	68,00.00
Production of Glycogen from *Perna Viridis* Shells	SSU	48,000.00

PATENTED TECHNOLOGY

TITLE OF TECHNOLOGY/ NAME OF INVENTORS	TARGET BENEFICIARIES	DATE FILED IN IPO PHILIPPINES/ APPLICATION NUMBER	STATUS
Process of Making Hog Plum and Batuan Flavor Enhancer (Necasio Abuda, Vivian L Moya)	Food Sector	2-2016-000907	Formality examination
A Fish Protein Concentrate (Leonora Doncillo, Vivian L Moya)	Food Sector	2-2016-000904	Formality examination
Process of extracting agar from Gracilaria Gelidiella (Vivian L Moya)	Aquaculture	2-2016-000434	Formality examination
Process of producing fish feed utilizing	Food	1-2016-000431	Formality

aquatic macrophyes (Vivian L Moya)	Sector/Fisheries		examination
Squid Rings (Vivian L Moya, Leonora Doncillo)	Food Sector/Fisheries	2-2016-000912	Formality examination
Fish Feed Formulation Utilizing Aquatic Macrophytes (Vivian L Moya)	Aquaculture	1-2016-000428	Formality examination
Standard Process of Producing Dried Shrimp (Vivian L. Moya, Leonora Doncillo)	Food Sector/Fisheries	2-2016-000911	Formality examination
Process of Preparing Squid Rings	Food Sector/Fisheries	2-2016-000906	Formality examination
Process of making cogon grass rhizome Tea (Vivian L. Moya, Felisa E. Gomba)	Public	2-2015-000699	Registered 2/12/2016
Method of Fresh-keeping and Preserving Caulerpa Lentillifera (Vivian Moya)	Fisheries	2-2015-000700	Registered 3/7/2016
Process of making chitin and chitosan from Perna viridis shells (Vivian Moya)	Aquaculture	2-2014-000662	Registered 11/26/2014
Process of making fish tocino (Vivian L. Moya, Leonora Doncillo, Jesus Racuyal, Aldrin Maglahus)	Fisheries	2-2014-000660	Registered 4/6/2015
Process for making turmeric powder (Vivian L. Moya, Leonora Doncillo)	Agriculture	2-2014-000666	Registered 4/6/2015
Production of Glycogen from Green Bay Mussel (Perna viridis) Shells (Vivian L. Moya, Renato Diocton)	Mussel Industry	2-2013000503	Registered 10/16/2013
Method for Making Pandan (Pandanus Amaryllipolius) Gel Cockroach Repellant Diana Shane Balindo, Vivian L. Moya)	Public	2-2014000501	Registered 10/16/2013
Method of Making Smoked Squid(Leonora D. Doncillo, Ronald L. Orale, Vivian L. Moya)	Food Industry	1-2013-000309	Published E-gazette, April 20, 2015
Organic Piscicide from Lantana camara and Adenium obesum Leaves (Vivian L. Moya, Luningning Amparado, Lolito Amparado)	Aquaculture	1-2013-000308	Published E-gazette, April 20, 2015

A Portable Slicing Machine (Felisa E. Gomba Gamaliel Baldos, Roberto Abarcar, Janet Diaz, Vivian Moya, Emilio Cebu, Rodolfo Dollado)	Banana chips industries in Buray, Paranas, Pinabacdao, Daram, and other municipalities in Samar	Feb. 9, 2012/ 12012000031	Published at E-Gazette Substantive Examination

R&D PROJECTS PRESENTED IN CONFERENCES/FORA/SYMPOSIUM

R&D PROJECTS PRESENTED IN CONFERENCES/FORA/SYMPOSIUM	DATE/ VENUE/ SPONSOR	TITLE OF CONFERENCE /SYMPOSIUM
Author/Presenter Leveraging technology and community partnerships in improving the banana chips industry in Samar	March 12-14, 2016/ Asian Intellect for Academic Org and Devt Inc.	1st International Research Forum in Education, Sciences and the Social Praxis 2016
Author/Presenter Process of making turmeric powder/Process of making Tocino/Process of making pandan gel cockroach repellant	November 25-27, 2015/DOST8	2015 Regional Invention Contest and Exhibits
Author/Paper Presenter Practices, Systems and Issues on Solid Waste Management of Catbalogan City, Samar	Oct. 27-28, 2014/VICARP Calbayog City	Inter Agency Research/Development and Extension Review
Author/Paper Presenter Effect of Active Learning Approach in Teaching Chemistry 101	Feb. 7-9, 2014 Baguio City	International Multi-Disciplinary Education and Development Conference
Author/Paper Presenter Production of Glycogen from *Perna viridis*	May 17-19, 2013 Aklan, Philippines Nov.17-18, 2011	1st International Young Scholars Conference Eastern Visayas Summit on RD&E In HEIs
Author/Paper Presenter Development and Evaluation of Organic Piscicide from Local Flora	December 4-6,2012 Malolos, Bulacan May 14, 2012 Calbayog City	2012 International Conference on Interdisciplinary Research Innovations 2nd Level VICARP In-House Review

R&D AWARDS/RECOGNITION

TITLE OF AWARD/RECOGNITION	AGENCY/ORGANIZATION	SCOPE/COVERAGE
2nd Runner Up Regional Invention Contest, Utility Model Category	DOST8	Regional
Best Diagnostic Report	UP-ISSI / DOST	Regional
Best Extension (First Prize)	Level 2 Cluster 3 Interagency RDE Review	Regional
Best Poster	25th Joint Vicarp and RRDEN Regional Research, Development and Extension Symposium	Regional
Loyalty/Service Award	SSU	Local
Best Innovative Consolanian Researcher Development and Evaluation of Organic Piscicide from Local Flora	2012 International Conference on Interdisciplinary Research Innovations	International

PUBLICATION

NAME OF PUBLICATION	TITLE OF ARTICLE	LEVEL OF PUBLICATION	DATE PUBLISHED
Countryside Development Research Journal, Special Issue, 2016	Modelling of Technology Protection Performance of State Universities in the Philippines	National	June 2016
Volume 2 Issue 3	Technology Protection Initiatives of Samar State University for Potential Revenue Generation	National	January-December 2014
Countryside Development Research Journal, Volume 2	Rice and Chips: A Book Review	National	June 2014
Standard Journal of Educational Research and Essay, Volume 2, Issue 3	Effect of Active Learning Approach in Teaching Chemistry 101	International	June 2014

SEMINARS/TRAINING PROGRAMS ATTENDED

Title of the Seminar/ Conferences/Workshop	Inclusive Dates of Attendance		Conducted/ Sponsored by
	(mm/dd/yyyy)	No. of Hours	
International			
Business of IP Asia	December 1-2, 2016	24	HKDTC, Hongkong
Global Health Forum 2015	August 24-27, 2015	32	COHRED AusAID, WIPO
Advanced Training Program on Successful Technology Licensing	Feb. 7-9, 2014	24	WIPO/IPOPHIL
International Multi-Disciplinary Education and Development Conference	Dec. 4-6, 2013	24	PanAsia Training Institute
WIPO/IPOPHIL Inter-Regional Workshop on Patent Analytics and Landscaping 1st International Young Scholars Conference	May 17-19, 2013	24	WIPO
2012 International Conference on Interdisciplinary Research Innovations	Dec. 4-6, 2012	24	ICIRI
27th Philippine Chemistry Congress, 2012 Asia-Pacific Conference on Analytical Science and 3rd Regional Electrochemistry Meeting of Southeast Asia	April 11-13, 2012	24	Kapisanan ng Kimika ng Pilipinas
National			
Knowledge and Technology Transfer Development Program (KTTO)	January 18-20, 2017	24	USAID STRIDE
Synergy 2016	September 21-23, 2017	24	USAID STRIDE
2016 National Invention Contest and Exhibits	July 28-29, 2016	16	DOST
ITSO Planning	July 12-14, 2016		IPOPHL
National Seminar on Patents and Innovation	March 1, 2016	8	SMX Convention Center, Taguig City
National Workshop on Increasing the Capacity and Pace for Technology Scouting, Absorption and Adaptation through a Hub and Spoke Structure (IP Hub)	February 29, 2016	8	UST, Espana, Manila
Orientation-Forum on DOST Intellectual Property and Data Sharing Policies for PCAARRD Stakeholders	February 17, 2016	8	DOST/Iloilo City

Writeshop for the Preparation of a Patent Application	Sept. 10-11, 2015	16	IPOPHIL
Patent Search Writeshop	Sept. 8-9, 2015	16	IPOPHIL
Seminar-Writeshop on Data Mining and Theory Building	Oct. 6-8, 2014	24	LNU/NSU,NORSU,SSU,SLSU
Seminar-Writeshop on Modeling and Simulation Models	Sept. 10-12, 2014	24	LNU/NSU,NORSU,SSU,SLSU
National Advanced Training Program on Successful Technology Licensing	Sept. 1-4, 2014	32	IPO/FIT-Australia
Seminar-Writeshop on the Preparation of Scientific Articles for Peer-Reviewed Journal	August 13-15, 2014	24	LNU/NSU,NORSU,SSU,SLSU
Training Evaluation: Measuring the Impact of Training	May 10, 2014	8	Business Coach Inc.
Successful Technology Licensing for Technology Managers	May 5-9, 2014	40	IPO/WIPO
WIPO Patent Search Training Workshop	Mar. 10-11, 2014	16	IPOPHIL/WIPO
Echo Seminar on IP Commercialization and 2nd ITSO Annual Planning	Nov. 25-27, 2013	24	De La Salle University, Manila
Commercializing IP Rights	May 8-9, 2013	16	Legazpi, Albay
Workshop on IP and Commercialization	January 23-24, 2013	16	IPOPHIL, Taguig City
ITSO FGD and Assessment of Capability and Planning	December 13-14, 2012	16	IPOPhl, Taguig City
PAQE Training	November 19-22, 2012	32	IPOPhl, Taguig City
Patent Drafting Training 2	November 6-7, 2012	16	IPOPhl, Taguig City
Patent Drafting Training 1 (Manual of Substantive Examination and Procedures and Implementing Rules and Regulation)	June 4-7, 2012	32	IPOPhl, Taguig City
Patent Information Training 1 (Techniques in Prior art Search and Validity Search)	May 29-31, 2012	24	IPOPhl, Taguig City
Foundation Course (Overview of the IP System, Patent Information and IP Management)	May 2-3, 2012	16	IPOPhl, Taguig City
36th FNRI Seminar Series on Research and Development and other S&T Projects	July 6-7, 2010	16	FNRI, DOST, Taguig City
Regional and Local			
Training of Local Resource Institutes (LRI) for the 2015 Citizen satisfaction Index System Implementation	April 24, 2015	8	DILG,

PROFESSIONAL SERVICES AND ACHIEVEMENTS

TITLE OF PROFESSIONAL SERVICES RENDERED	TITLE OF ACTIVITIES/ NATURE OF PARTICIPANTS	DATE	SPONSOR AGENCY
As Consultant			
DOST-MPEX Consultancy	Provide consultancy services to micro enterprises	2015-Present	DOST
R&D Reviewer/Evaluator			
Paper Evaluator	2016 Conference on Assessment	October 31, 2016	CGS
R&D Paper Evaluator	2016 Center for Fisheries and Aquatic Resources R&D In-House Review	November 8, 2016	CFARD, SSU
R&D Paper Evaluator	2014 Research Proposal Presentation and Evaluation	July 16, 2014	SSU
Session Judge/Evaluator	2012 International Conference on Interdisciplinary Research Innovations	Dec. 4-6, 2012	La Consolacion University
R&D Paper Evaluator	SSU In-House Review Faculty Researchers	October 20, 2012	Samar State University, Catbalogan City
University Technical Reviewer	2008-2012 University Journals Faculty Researchers	February 1, 2008	SSU
As Resource Speaker/Lecturer			
Resource Speaker	SLSU Training/Seminar on Patent Drafting	May 11-13, 2016	SLSU
Resource Speaker	In-House Seminar Workshop on Academic and Administrative Processes Towards Productivity and Excellence	May 25-27, 2016	SSU
Resource Speaker	ITSO Orientation Seminar with SLSU Faculty	October 26, 2015	SSU
Resource Speaker	Research and IP Seminar with Samar College Faculty	June 2015	Samar College
Resource Speaker	2014 Research Proposal Writeshop Seminar	July 8-9, 2014	SSU
Resource Speaker	Patenting and Intellectual Property Rights	August 16, 2013	University of Eastern Philippines, Catarman, Northern Samar

Resource Speaker	Research Patenting and Intellectual Property Rights	February 15, 2013	Palompon Institute of Technology, Palompon, Leyte
Resource Speaker	Hands-On Workshop on Patent Drafting Faculty Researchers of SSU	June 17-18, 2013	Samar State University, Catbalogan City Samar
Resource Speaker	In-House Seminar Workshop for the Academic Personnel of Samar State University	May 28-30, 2013	Samar State University, Catbalogan City, Samar
Resource Speaker	EVCIERD Funder's Forum and Writing a Research Proposal Seminar Researchers/Faculty of SUC's in Region 8	September 3-5, 2012	EVCIERD, SSU
Resource Speaker	Research Writing Seminar and In-House Review Faculty	August 17-18, 2012	College of Graduate Studies, SSU, Catbalogan Samar
As Organizer			
Field Supervisor	2015 Citizen Satisfaction Index System (CSIS)	May 7-10, 2015	NEDA
Facilitator	SSU Centennial Celebration		SSU
Organizer	Funders' Forum and R&D Proposal Writing Faculty from different SUCs in Region VIII	Sept. 3-5, 2012	EVCIERD-SSU
Organizer	Competition on Idea Generation for Technology Innovation and Invention	August 29-30, 2012	SSU
Organizer	In-House Seminar Workshop for SSU Academic Personnel	May 16-18, 2012	SSU

MEMBERSHIP OF PROFESSIONAL ORGANIZATIONS

NAME OF ORGANIZATION	ROLE/ RESPONSIBILITY	STATUS OF MEMBERSHIP	SCOPE OR COVERAGE
ILS Development and Training Inc.	Member	Active	National
Asian Intellect for Academic Organization and Development Inc.	Member	Active	National
Asian Academic Association in Research and Management, Inc.	Member	Active	National
Intellectual Property Office of the Philippines-ITSO	Manager	Active	National
Visayas Consortium for Agriculture and Resources Program	REACTF Member	Active	Regional
Philippine Association of Chemistry Teachers	Member	Active	National
SSU Personnel Association	Member	Active	Local

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